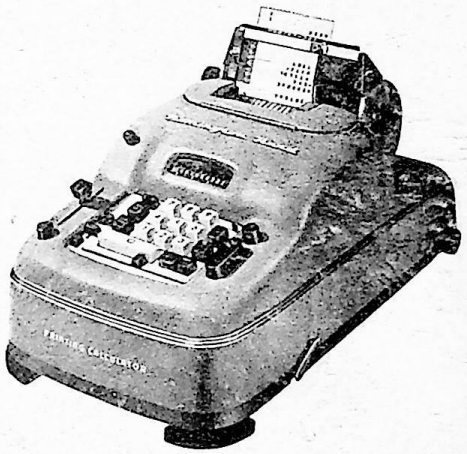
# REMINGTON
# ADDING MACHINE
## MODELS 94 and 98

## *INSTRUCTION MANUAL*



**Remington Rand**
DIVISION OF SPERRY RAND CORPORATION
315 PARK AVENUE SOUTH, NEW YORK 10, N.Y.

DM-154

MECHANICAL INSTRUCTIONS

# REMINGTON ADDING MACHINE

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315 PARK AVENUE SOUTH
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Printed in USA

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- 012 etc

Print on add back - & backspace
M & Q feeds on return stroke

Only one sig. figure per ÷ prob.

Carry over - print - add back - backspace

## DIVISION

Division is a process of subtracting a small number from a large and counting the number of times the small number may be taken from or goes into the large number. To set up a division problem in the machine, enter the dividend into the keyboard and add it into machine. Then enter the Divisor in the keyboard and add additional spaces to make the number of digits in the divisor equal the number of digits in the dividend. Then depress divide key. The complete operation will be performed automatically including the blank stroke and total and remainder if any.

The following example shows exactly what takes place on each stroke of the machine. For this example let us divide 147 by 12. First we enter 147 in the keyboard and add it in the wheels, then we enter 12 in the keyboard and add one space making the number of digits in the divisor equal the number of digits in the dividend. Then depress the divide key. The Accumulator Wheels will immediately go to subtract position and will remain there adding to the Subtract Wheels until a complete carry over occurs. In order for a complete carry over to occur the divisor must be added to the subtract wheels one more time than the divisor may be taken away or goes into the dividend. After the carry over occurs the wheels return to add position and add back the divisor once to compensate for the additional time the divisor had to be added to the subtract wheels to cause the carry over operation. At the same time the backspace mechanism will backspace a space out of the Stop Section. The Wheels will then return to subtract position and the procedure will be repeated until all spaces have been backspaced out of the Stop Section.

When a figure other than a space is backspaced into the units column, the machine will go through the same procedure as outlined above, however, instead of backspacing on the add back stroke, the Stop Section will clear and the machine will automatically take a blank stroke and total and stop.

Example - 147 ÷ 12

Machine Operation

9999999999 Subtract Wheels

0000000000 Add Wheels

147 Dividend

0000000147 Add Wheels

9999999852 Subtract Wheels

12S Divisor - Non - Printed and added to Subtract Wheels

9999999972 Subtract Wheels

12S Divisor - Non - Printed and added to Subtract Wheels

0000000092 Subtract Wheels

9999999907 Add Wheels

| | |
|---|---|
| 12S | Divisor - Printed, added to Add Wheels and backspace |
| 0000000027 | Add Wheels |
| 9999999972 | Subtract Wheels |
| 12 | Divisor - Non - Printed and added to Subtract Wheels |
| 9999999984 | Subtract Wheels |
| 12 | Divisor - Non - Printed and added to Subtract Wheels |
| 9999999996 | Subtract Wheels |
| 12 | Divisor - Non - Printed and added to Subtract Wheels |
| 0000000008 | Subtract Wheels |
| 9999999991 | Add Wheels |
| 12 | Divisor - Print, add to Add Wheels and clears top section |
| 0000000003 | Add Wheels |
| | Blank Stroke |
| 3* | Total Stroke |

Printed on Tape

| Quotient | |
|---|---|
| 1 | 147 Dividend |
| 2 | 12S Divisor |
| | 3* Remainder |

## DIVISION OPERATION

### Positioning Parts

When Division Lever (1) Plate - 1 is depressed, lower extension (X) of Division Lever contacts Division Control Arm (2), rocking the arm to front. Rear portion (Z) of Scissors will contact lip (C) of Division Drive Arm (3), opening the scissors and allowing Division Drive Arm (3) to limit on hub of Division Control Arm (2). As Division Drive Arm (3) moves down, a stud (D) on rear portion of Division Drive Arm (3) contacts left Division Shaft Arm (4), rocking it clockwise. Lower extension (Y) of Left Division Shaft Arm (4) contacts roll (F) on Non-Print Linkage (5), bringing Non-Print Linkage (5) to the front of machine. The Non-Print Block Arm (5A) is raised to block Hammer Restoring Bail, Two Speed Link (6) is moved forward, Outer Pawl (7) is brought to a latching position and Long Pawl (8) moves to an over-latched position of its latch (9).

On right side, the Right Division Shaft Arm (10) Plate-2 moves to an overlatched position of its latch (11) and rear portion (H) of Right Division Shaft Arm (10) contacts roll (J) on Subtract Operating Bail (12) raising the Bail and Yield Arm (24) positioning Vertical Member of Subtract Slide for a Subtract Operation. Inner Link (K) on the Right Division Shaft Arm (10) lifts Plunger Bail (12) and Plunger (7) Plate 3, Outer Link (L) Plate 2 or Automatic Remainder Link moves to an overlatched position of its latch (13) tripping the Motor. ~~The Automatic Remainder Link (L) will remain latched during entire Division operation.~~ Also Automatic Remainder Link (L) will rotate Subtract Slide Pawl Bell Crank and raise Subtract Slide Pivot Pawl to disable credit balance mechanism.

RIGHT ARM WILL MOVE FROM OVERLATCH TO CATCH POS WITH CATCH.

### First Forward Stroke

As Backspace Cam (M) Plate 1 moves forward, Backspacer (14) will latch on the Outer Pawl (7), roll (N) on inside of the Backspace Cam (M) contacts rear of the Division Drive Arm (3) positioning lip (C) on front of Division Drive Arm (3) over rear portion (Z) of the Scissors. The Accumulator Wheels will revolve from Add to Subtract.

### First Return Stroke (Non-Print and Add to the Subtract Wheels)

As Backspace Cam (M) restores, lip (C) on Division Drive Arm (3) will rest on rear portion (Z) of Scissors. Consecutive strokes will be taken in Subtract position until a complete Carry Over occurs.

### Carry Over Stroke

When the last Carry Pawl (15) Plate 2 is depressed, Motor Control Slide (16) will move into Carry position contacting Motor Control Arm (17) and releasing Right Division Shaft Arm (10) from its latch (11). As Right Arm (10) restores, the Subtract Arm Operating Bail (12) and Yield Arm (24) will restore allowing Vertical Member to drop. Plunger Bail (12) and Plunger (7) Plate 3 will drop, but Automatic Remainder Link (L) Plate 2 will ~~remain~~ BECOME latched.

On the Left Side, Left Division Shaft Arm (4) Plate 1 will restore permitting Non-Print Linkage (5) to restore Non-Print Block Arm (5A), Two Speed Link (6) and Outer Pawl (7). Long Pawl (8) is latched with its latch (9).

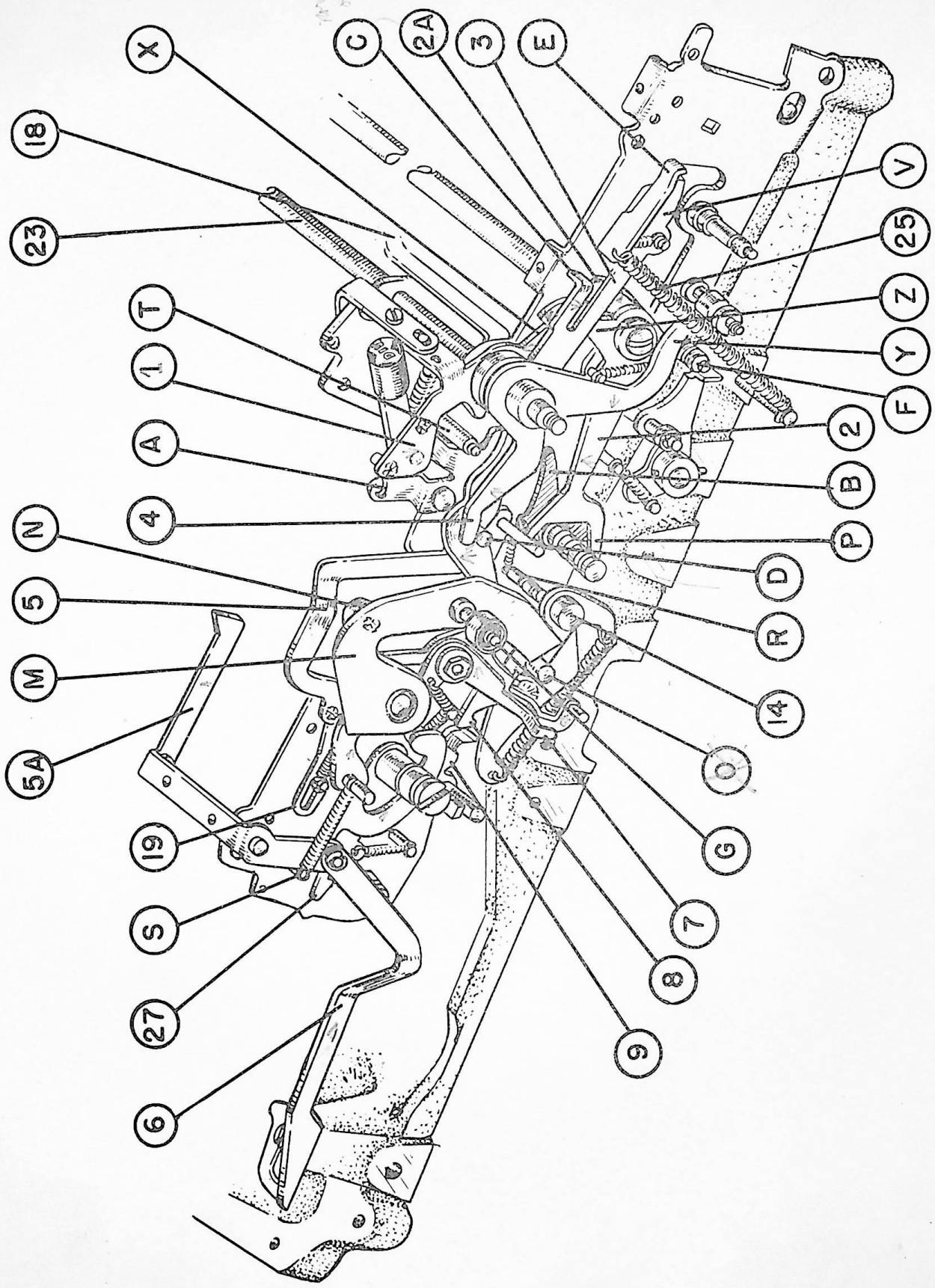



PLATE 1 DIVISION MECHANISM

Add Back Stroke

FORWARD

As the Backspace Cam (M) Plate 1 moves down, Backspacer (14) will move to front of Backspace Cam (M). Accumulator Wheels will revolve from Subtract to add position.

RETURN

On return stroke machine will print, add to Add Wheels and Backspace. The Backspace Cam (M) will rock Backspacer (14), raising Plunger Bail (12) & Plunger (7) Plate 3 and Backspacing one space from Stop Section. A stud (O) Plate 1 on Backspacer (14) contacts extension (P) of Division Control Arm (2) opening the scissors, Division Drive Arm (3) drops on hub of Division Control Arm (2) and all parts are repositioned for another Subtract Operation.

The foregoing procedure will be repeated until all space's are Backspaced from Stop Section, or until a Significant figure appears in Units Column.

Significant Figure Forward Stroke

As Backspace Cam (M) Plate 1 moves forward, Backspacer (14) will latch under Outer Pawl (7). As the Units Rack moves rearward, Division Bail (18) will rock, restoring the Division Lever, (1) also latching Arm "A" in front of Latch "B", bringing Link (19) to the front. Roll (N) on inside of Backspace Cam (M) contacts the rear of Division Drive Arm (3), positioning Lip (C) of Division Drive Arm (3) over the front portion (2A) of scissors so that machine cannot be put back into Division except by depressing Division Lever (1). Accumulator Wheels will revolve from Add to Subtract.

Significant Figure Return Stroke (Non-Print and Add to the Subtract Wheels)

As the Backspace Cam (M) restores, Lip (C) on the Division Drive Arm (3) will rest on the front portion (2A) of the scissors. Consecutive strokes will be taken in the subtract position until a complete Carry Over occurs.

Significant Figure Carry Over Stroke

The same as Normal Carry Over Stroke except that as the Non-Print Link (5) restores, the Inner Pawl (4) Plate 9 will be brought into a latching position and as the Outer Pawl (7) restores, the Backspacer (14) will be transferred to the Inner Pawl or on next forward stroke will be latched on the Inner Pawl.

Significant Figure Add Back Stroke

As the Backspace Cam (M) moves forward the Backspacer (14) will be cammed down and the Backspace Cam (M) will release the Long Pawl (8) from its Latch (9). The Accumulator Wheels will revolve from Subtract to add position. On the return stroke the machine will print, Add to the Add Wheels and clear the Stop Section. As the Stop Section restores the Blank Stroke Lock Bell Crank is rocked, restoring Latch "B" and Arm "A", Link (19) moves to the rear restoring the Inner Pawl and as the Backspace Cam (M) restored, it latched the Backspacer (14) on the Long Pawl (8).

Blank Stroke

Restore Total Lock Link (20) Plate 2 and Carry Pawls.

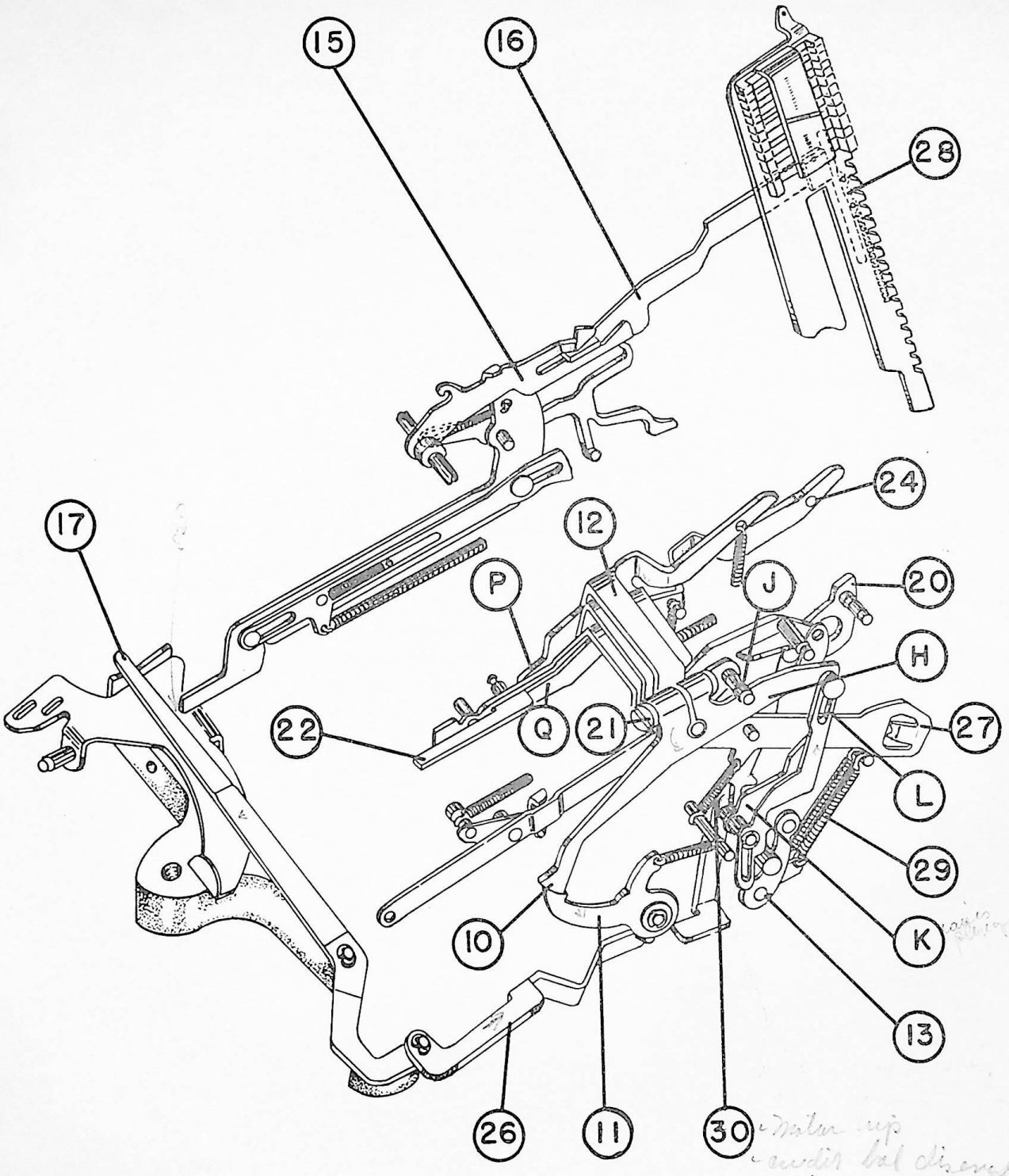



PLATE 2 DIVISION MECHANISM

Total Stroke

As the Total Slide moves to the rear, the fork (H) Plate 16 on the Total Slide will rock the Feature Key Latch (13) Plate 2 allowing the Automatic Remainder Link (L) to restore. The Remainder, if any, will be printed and at the end of the cycle the machine will stop.

Release Key Operation (Used to Stop Division Problem)

When Release Key is pulled to front of machine, it positions Arm "A" in front of Latch "B", bringing Link (19) Plate 1 to the front.

Machine will continue to operate in subtract position until a complete carry over occurs releasing the Division Mechanism. As the Non-Print Linkage (5) restores the Inner Pawl (4) Plate 9 will be brought to a latching position and as the Outer Pawl (7) restores, the Backspacer (14) will be transferred from the Outer Pawl (7) to the Inner Pawl (4) Plate 9.

Add Back STROKE OF RELEASE KEY OPERATION

Machine will print, add to the Add wheels, and clear the Stop Section. As the Stop Section restores it will rock the Blank Stroke Lock Bell Crank Restoring Arm "A", Latch "B", Link (19) and the Inner Pawl.

The Blank Stroke and Total strokes will be the same as previously described for division, except that Division Bail (18) will rock on blank stroke operation and restore the Division Lever (1).

Error Operation (When Problem is Entered Improperly) WITHOUT ENOUGH SPACES

Machine will continue to operate in subtract but no carry over will occur. Therefore M & Q Rack will feed three spaces above nines position. On the next forward stroke the Motor Control Slide (16) will move to the rear camming down its own Carry Pawl (15) and restoring the Division Lever (1). On the return stroke the Rack Restoring Bail will place the Motor Control Slide (16) into carry position releasing the division mechanism for an add back stroke. The Plunger (7) will be dropped and the Stop Section will clear on the add back stroke. The Blank Stroke and Total will be normal operations.

EXTEND KEY OPERATION (EXTEND KEY BLOCKS OUT DIVISION BAIL)
USED TO EXTEND A DIVISION PROBLEM.
DIVISION BAIL WILL NOT ROCK
MACHINE WILL CONTINUE TO DRIVE UNTIL ALL OF THE FIGURES ARE BACKSPACED OUT OF THE STOP SECTION. THE MACHINE WILL THEN RUN FOR AN ERROR OPERATION AND STOP.

## MULTIPLICATION

Multiplication is a process of repeated addition. To set up a multiplication problem in the machine, enter the multiplicand in the keyboard and add one less space than there are digits in the multiplier. As an example problem, let us multiply 375 by 125. First we list 375 in the keyboard and add two spaces, one less space than there are digits in the multiplier. Multiplication is performed from left to right so it will be necessary to start with the figure 1 of the multiplier. Push the Multiply Lever to the rear and count one stroke of the machine and release the Multiply Lever, the machine will take an additional stroke after releasing the Multiply Lever. On the first stroke the parts will be positioned so that the second stroke will automatically print, add and backspace a space out of the Stop Section. The machine will then stop.

To multiply by the 2, Push the Multiply Lever to the rear and count two machine cycles. For the 5, push the Multiply Lever to the rear and count five machine cycles. In each case the machine will take an additional stroke, on this additional stroke the machine will print and backspace as long as there are spaces in the units column. After all spaces have been backspaced out and a figure other than a space is in the units column, on the additional stroke, the machine will print and clear the Stop Section. An automatic blank stroke and total will be taken and the machine will stop.

Example - 375 X 125

Machine Operation

9999999999 Subtract Wheels

0000000000 Add Wheels

375SS Non-Print & Non-Add Operation

0000000000 Add Wheels

375SS Print, Add and Backspace

0000037500 Add Wheels

375S Non-Print & Non-Add Operation

0000037500 Add Wheels

375S Non-Print & Add Operation

0000041250 Add Wheels

375S Print, Add and Backspace.

0000045000 Add Wheels

375 Non-Print & Non-Add Operation

0000045000 Add Wheels

## MULTIPLICATION

375 Non-Print & Add Operation

0000045375 Add Wheels

375 Non-Print & Add Operation

0000045750 Add Wheels

375 Non-Print & Add Operation

0000046125 Add Wheels

375 Non-Print & Add Operation

0000046500 Add Wheels

375 Print, Add and clear Stop Section

0000046875 Add Wheels

Blank Stroke

46875 *Total Stroke

Printed on the Tape

Multiplier
1
2
5

375 Multiplicand

46875 *Product

## MULTIPLICATION OPERATION

### Positioning of Parts

As multiply Lever (1) Plate 3 is pushed rearward, stud (C) on Multiply Lever (1) picks up Multiply Non-Add Drive Pawl (9) rocking the Multiply Non-Add Bell Crank (10), positioning Non-Add Lock Lever Assembly behind Total Lock Cam. The lower rear extension (E) of Multiply Lever (1) contacts roll (F) on Non-Print Link Bell Crank bringing the Non-Print Linkage (5) Plate (1) toward front of machine. The Non-Print Block Arm (5A) moves up to block Hammer Restoring Bail, Outer Pawl (7) moves into a position to receive Backspacer (14) and the Long Pawl (8) moves to an over-latched position of its Latch (9) and Two Speed Link (6) moves forward. As Multiply Lever (1) Plate 3 was pushed rearward, Dial Rack Raising Arm Slide (4) moved to front and was latched by Feature Key Latch. Roll (H) which normally rests in dwell at rear of Dial Rack Raising Arm Slide (4) moves up to position (4B) on slide, rocking Dial Rack Raising Arm Shaft (5) which in turn through Arm (6) positions Plunger (7) and also raises M & Q Rack one space. Roll (J) on front end of the Dial Rack Raising Arm Slide (4) contacts left arm (K) of Motor Drive Control Shaft (11) moving Motor Drive Control Arm Drive Pawl (8) to a limit against Extension "E" Plate 1 of Division Shaft Drive Arm (3) and at same time tripping the Motor.

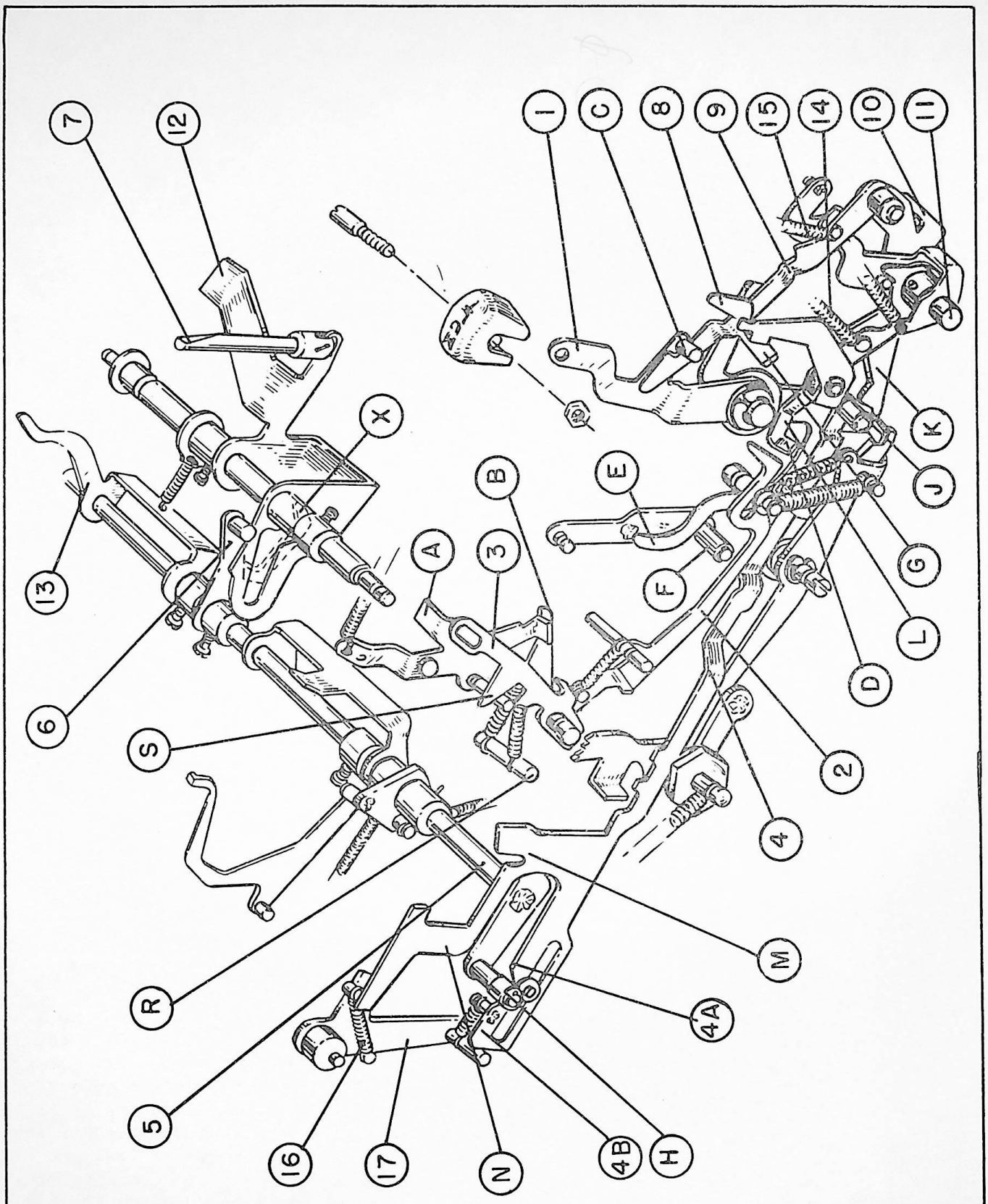



PLATE 3 MULTIPLICATION MECHANISM

MULTIPLYING BY 1 WITH A SPACE IN UNITS COLUMN

First Stroke non print add.

As Backspace Cam (M) Plate 1 moves down it latches Backspacer (14) under Outer Pawl (7). Roll (N) on inside of the Backspace Cam (M) contacts rear of Division Drive Arm (3), raising extension "E" and allowing Motor Drive Control Arm Drive Pawl (8) Plate 3 to move under extension "E" Plate 1. At the same time, Non-Add Release Plate (V) Plate 1 moves over lip (G) Plate 3 of Non-Add Drive Pawl (9). Return stroke is a non-print, non-add operation. As Main Shaft restores, roll (N) Plate 1 on the inside of Backspace Cam (M) will allow extension "E" to move downward causing Non-Add Release Plate (V), to cam Non-Add Drive Pawl (9) Plate 3 off stud (C) on Multiply Lever (1) and at the same time pushing downward on Motor Drive Control Arm Drive Pawl (8) to keep motor running for the second operation. M & Q Rack is fed up one space, as Lower Marcel Link rocks Feature Key Latch (13) Plate 1 Dial Rack Raising Arm Slide (4) Plate (4) will restore. Roll (H) at rear of Slide (4) will now return to dwell allowing Shaft (5), Arm (6) and Restoring Link Plunger (7) to drop, but M & Q Rack will stay up. Multiply Lever (1) restores permitting Non-Print Linkage (5) Plate 1 to restore. The Non-Print Block Arm (5A) Two-Speed Operating Link (6), Outer Pawl (7) restore and Long Pawl (8) latches with its latch (9).

Second Stroke

This is an automatic stroke. As Backspace Cam (M) Plate 1 moves forward roll (N) on the inside of Backspace Cam contacts Division Drive Arm (3) and raises extension "E". Motor Drive Control Arm Drive Pawl (8) Plate 3 restores, Backspacer (14) Plate 1 moves to the front of Backspace Cam (M). Return stroke is a print and add stroke. As Backspace Cam (M) restores it rocks Backspacer (14) down, lifting the Plunger (7) Plate 3 and Backspacing a space out of Stop Section. M & Q Rack restores and motor stops as the Motor Drive Control Arm Drive Pawl (8) has been restored.

All of the foregoing procedure will be repeated until all spaces are backspaced out of Stop Section, or until a significant figure appears in units column.

1ST FORWARD MULTIPLYING BY ONE

Significant Figure Stroke

Multiply Lever (1) Plate 3 pushed to rear, all parts will be positioned as originally positioned. As Backspace Cam (M) Plate 1 moves down it latches Backspacer (14) under Outer Pawl (7), Inner roll (N) on Backspace Cam (M) contacts the rear of Division Drive Arm (3), raising extension "E". Motor Drive Control Arm Drive Pawl (8) Plate 3 moves under extension "E" Plate 1 and Non-Add Release Plate (V) moves over lip (G) Plate 3 on Non-Add Drive Pawl (9) Plate 3. Units Rack will move to rear allowing Division Bail (18) Plate 1 to rock, Arm "A" is brought to front of Latch "B" and Link (19) moves to front of machine. Link "3" Plate 3 will be raised, unlatching Link "2". Link "2" will rest against Lip "D" of Left Motor Control Shaft Arm (L).

The return stroke is a Non-Add, Non-Print operation. As Main Shaft restores Inner Roll (N) Plate 1 on Backspace Cam (M) will allow extension "E" to move down. The Non-Add Release Plate (V) will release Non-Add Drive Pawl (9) Plate 3 from stud (C) in Multiply Lever (1). Motor Drive Control Arm Drive Pawl (8) will move down until Lip "D" is low enough for Link "2" to move over it. This will keep motor running for remainder of Multiply Operation. The Lower Marcel Link will rock Feature Key Latch (13) Plate 1 and allow Dial Rack Raising Arm Slide (4) Plate 3 to restore.

Multiply Lever (1) will restore allowing the Non-Print Linkage (5) Plate 1 to restore permitting Non-Print Block Arm (5A), Two Speed Operating Link (6) and Outer Pawl (7) to restore. Inner Pawl will move into latching position as Outer Pawl (7) restores. The Backspacer (14) will transfer from Outer Pawl (7) to Inner Pawl.

Significant Figure Automatic Stroke

As Main Shaft moves forward Backspace Cam (M) Plate 1 moves down and unlatches Long Pawl (8) from its latch (9). As the Main Shaft restores Backspacer (14) will latch on Long Pawl (8). Machine will print, add and clear Stop Section. Blank Stroke Lock Bell Crank will restore Arm "A", Latch "B", Link (19) and Inner Pawl.

Blank Stroke

Total Lock Link (20) Plate 2 will be restored as well as any carry pawls that may be down.

Total Stroke

As Total Slide moves rearward, fork on Total Slide rocks Feature Key Latch. The roll on the Feature Key Latch contacts upright extension of Link "2" Plate 3, moving it to the rear off lip "D" and latching it behind Link "3". As extension "E" Plate 1 moves up Motor Drive Control Arm Drive Pawl (8) Plate 3 will restore, allowing Motor Control Shaft (11) to restore. The Total will be printed and machine will stop.

## MULTIPLY LEVER TO THE FRONT

Positioning of Parts

As the Multiply Lever (1) Plate 3 is pulled forward, Dial Rack Raising Arm Slide (4) will move rearward. Roll (H) that usually rests in dwell of Slide (4) will move up to position (4A) of Slide, raising the M & Q Rack up one space but will not raise Reset Link Plunger (7). The upright portion (M) of Slide (4) will hold the Long Pawl (8) Plate 1 clear of Backspacer (14). Extension (N) of Slide (4) Plate 3 will hold the Long Pawl Latch (9) Plate 1 clear of Long Pawl (8). Dial Rack Raising Arm Slide (4) Plate 3 will be latched by Feature Key Latch. The upper stud (C) on Multiply Lever (1) will hold Motor Drive Control Arm Drive Pawl (8) to front of Extension "E" Plate 1. The lower front stud (not shown) on Multiply Lever (1) will contact Multiply Non-Add Bell Crank (10) positioning the Non-Add Mechanism. The same stud will contact left Motor Control Shaft Arm (K) rotating Motor Control Shaft (11) and through right Motor Control Shaft Arm will trip motor.

## MULTIPLYING BY A ~~CIPHER~~ ZERO WITH A SPACE IN THE UNITS COLUMN

Forward Stroke

As the Backspace Cam (M) Plate 1 moves down Backspacer (14) will move to front of Cam (M). Extension "E" will raise but Motor Drive Control Arm Drive Pawl (8) Plate 3 will not move underneath.

Return Stroke Print, Non add, & backspace.

The machine will Print, Non-Add and Backspace a space out of Stop Section. Near end of the stroke Feature Key Latch will unlatch Dial Rack Raising Arm Slide (4) allowing Slide (4) to restore. Roll (H) at rear of Slide (4) will move back to the dwell of Slide (4) and M & Q Rack will restore. The Long Pawl (8) Plate 1 and Long Pawl Latch (9) will restore. Non-Add Mechanism and Motor Drive Control Arm Drive Pawl (8) Plate 3 as well as Multiply Lever (1) will restore and machine will stop.

MULTIPLYING BY ~~A CIPHER~~ ZERO WITH A SIGNIFICANT FIGURE IN THE UNITS COLUMN

Parts will be positioned as previously described.

As Main Shaft moves forward Units Rack will move to the rear. Division Bail (18) Plate 1 will rock positioning Arm "A" in front of Latch "B", bringing Link 19 forward and positioning Inner Pawl to receive the Backspacer (14). Link "3" Plate 3 will be raised releasing Link "2" to rest against Lip "D".

The Backspace Cam (M) Plate 1 will move down latching Backspacer (14) on Inner Pawl. Stud "G" on Backspace Cam will contact extension (M) Plate 3 of Dial Rack Raising Arm Slide (4) moving Slide (4) rearward and lowering Lip "D" permitting Link "2" to move over Lip "D".

On the return stroke, machine will Print, Non-Add and clear Stop Section. As Stop Section restores Blank Stroke Lock Bell Crank will rock restoring Latch "B", Arm "A", Link 19 Plate 1 and Inner Pawl. The Feature Key Latch will unlatch Dial Rack Raising Arm Slide (4) Plate 3 allowing Slide (4) to restore. Roll (H) at rear of Slide (4) will move back to dwell of Slide (4) permitting the M & Q Rack to restore. Long Pawl (8) Plate 1 and Long Pawl Latch (9) will restore. Non-Add Mechanism and the Motor Drive Control Arm Drive Pawl (8) Plate 3 will restore. The machine will continue to run for Blank Stroke and Total due to Link "2" being over Lip "D".

Blank Stroke

The Backspace Cam (M) Plate 1 will latch Backspacer (14) on Long Pawl (8). Motor Drive Control Arm Drive Pawl (8) Plate 3 moving under Extension "E" Plate 1 is meaningless. Total Lock Link (20) Plate 2 will restore.

Total Stroke

As Total Slide moves rearward fork on the Slide will rock Feature Key Latch. The roll on Feature Key Latch will contact upright portion of Link "2" Plate 3 unlatching it from Lip "D" and latching it behind Link "3". Motor Drive Control Arm Drive Pawl (8) will move out from under Extension "E" Plate 1.

The Total will be printed and machine will stop.

EXTEND KEY MAY BE USED ON LARGE MULTIPLICATION PROBLEM WHERE THERE IS NOT ENOUGH COLUMNS TO ADD CORRECT NUMBER OF SPACES BEHIND MULTIPLICAND. MACHINE WILL NOT TAKE AUTO. BK. STROKE AND TOTAL WITH EXTEND KEY LATCHED.

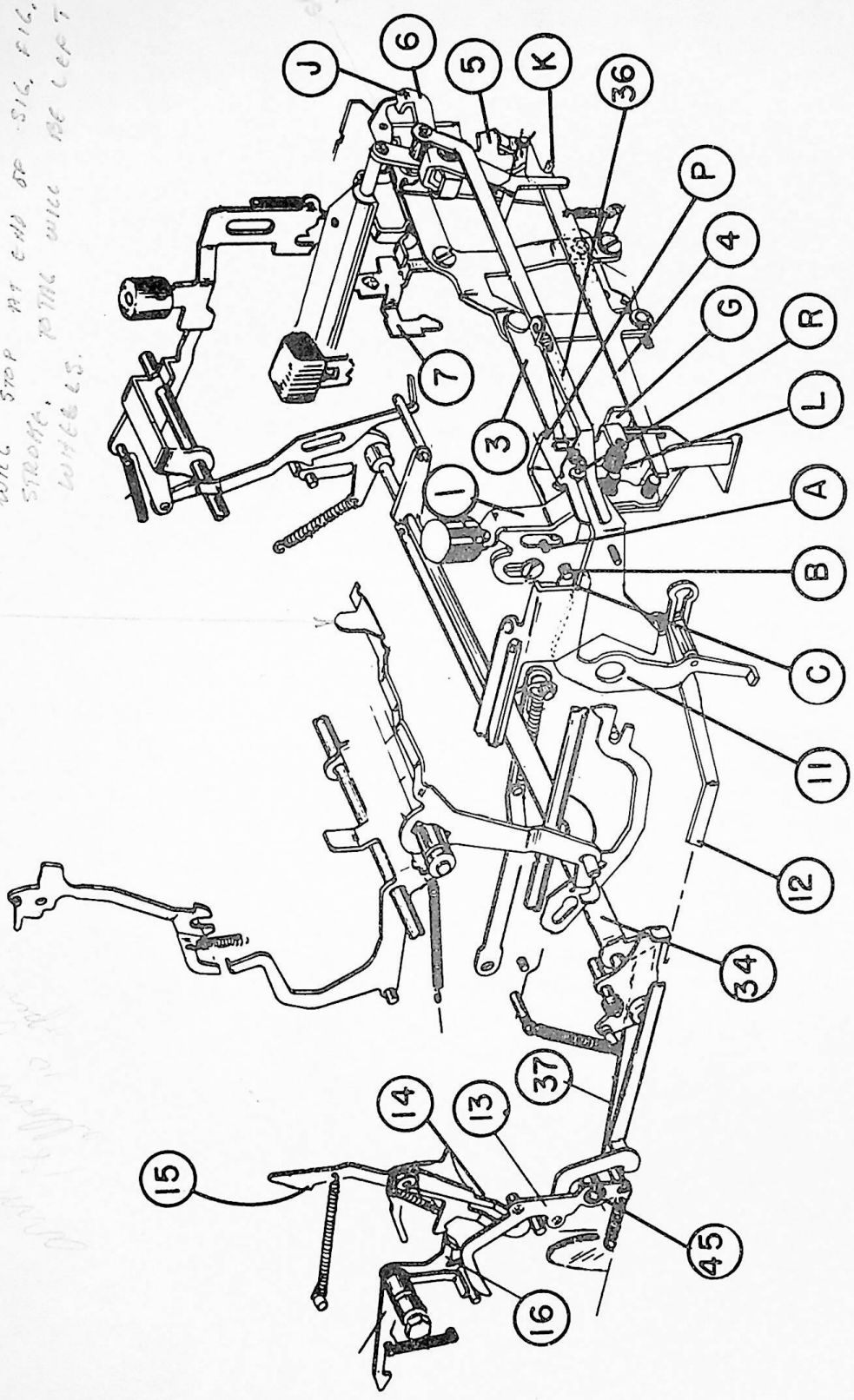



PLATE 4 SHORT CUT MECHANISM

## SHORT CUT MULTIPLICATION

The purpose of Short Cut Multiplication is to save machine cycles and operator time when multiplying by digits 6, 7, 8 and 9.

The multiplicand is set up in the machine the same as for regular multiplication. When multiplying by digits 6, 7, 8 and 9, depress the Short Cut Key before operating the Multiply Lever. Hold the Multiply Lever to the rear for 10 minus digit of multiplier strokes. That is, to multiply by 9, hold lever 1 stroke. To multiply by 8, hold lever 2 strokes etc.

If the Short Cut Key is depressed mistakenly, it can be released by pushing the Backspace Key to the right until it limits. This places the machine condition where it was before the Short Cut Key was depressed and the operator can continue with the problem.

Depressing the Short Cut Key adds a space to the right of the multiplicand. On the first stroke this amount will be added to the Add Wheels, this space will be backspaced out of the Stop Section and the Short Cut Key will be released. Each subsequent stroke will add to the Subtract Wheels. On the print stroke the machine will backspace and restore all Short Cut parts. It should be remembered that the machine backspaces on the first and last stroke of a Short Cut Multiplier as long as there are spaces in the Units column. When a figure other than a space is in the Units column, the machine will backspace on the first stroke and clear the Stop Section on the last stroke.

### Positioning Parts

As the Short Cut Key (1) Plate 4 is depressed, Short Cut Space Bell Crank (3) will rotate causing Short Cut Space Drive Pawl (4) to rotate Short Cut Space Yield Arm (5) and Short Cut Space Operating Arm (6). This will cause Space Key (7) to be depressed adding a space to the Stop Section. Upper stud (A) on Short Cut Key (1) will rotate Negative Multiply Operating Arm Latch Release (8) Plate 5, stretching the yielding spring (9) and putting tension on Negative Multiply Operating Arm Latch (10).

The lower stud (B) on Short Cut Key (1) Plate 4 contacts and lowers Non-Add Drive Pawl (9) Plate 3 out of path of stud (C) on Multiply Lever (1) so that no Non-Add operations take place on Short Cut Multiplication. The lower extension (C) Plate (4) of Short Cut Key (1) will rotate the Backspace Control Pawl Lever (11) which in turn thru Link (12), will position the Backspace Control Pawl Operating Arm (13) rearward holding the Outer Pawl (14), Long Pawl (15) and Long Pawl Latch (16) to the rear so machine will backspace on first return stroke. Short Cut Key (1) will be latched by Short Cut Key Latch (17) Plate 5.

### First Forward Stroke

MULT. BY NINE - SPACE IN UNITS COLUMN.

The Backspace Cam (M) Plate 1 moves down and allows the Backspacer (14) to move to front of it. Roll on stud "G" contacts Negative Multiply Operating Arm (18) Plate 5 unlatching it from it's latch (10).

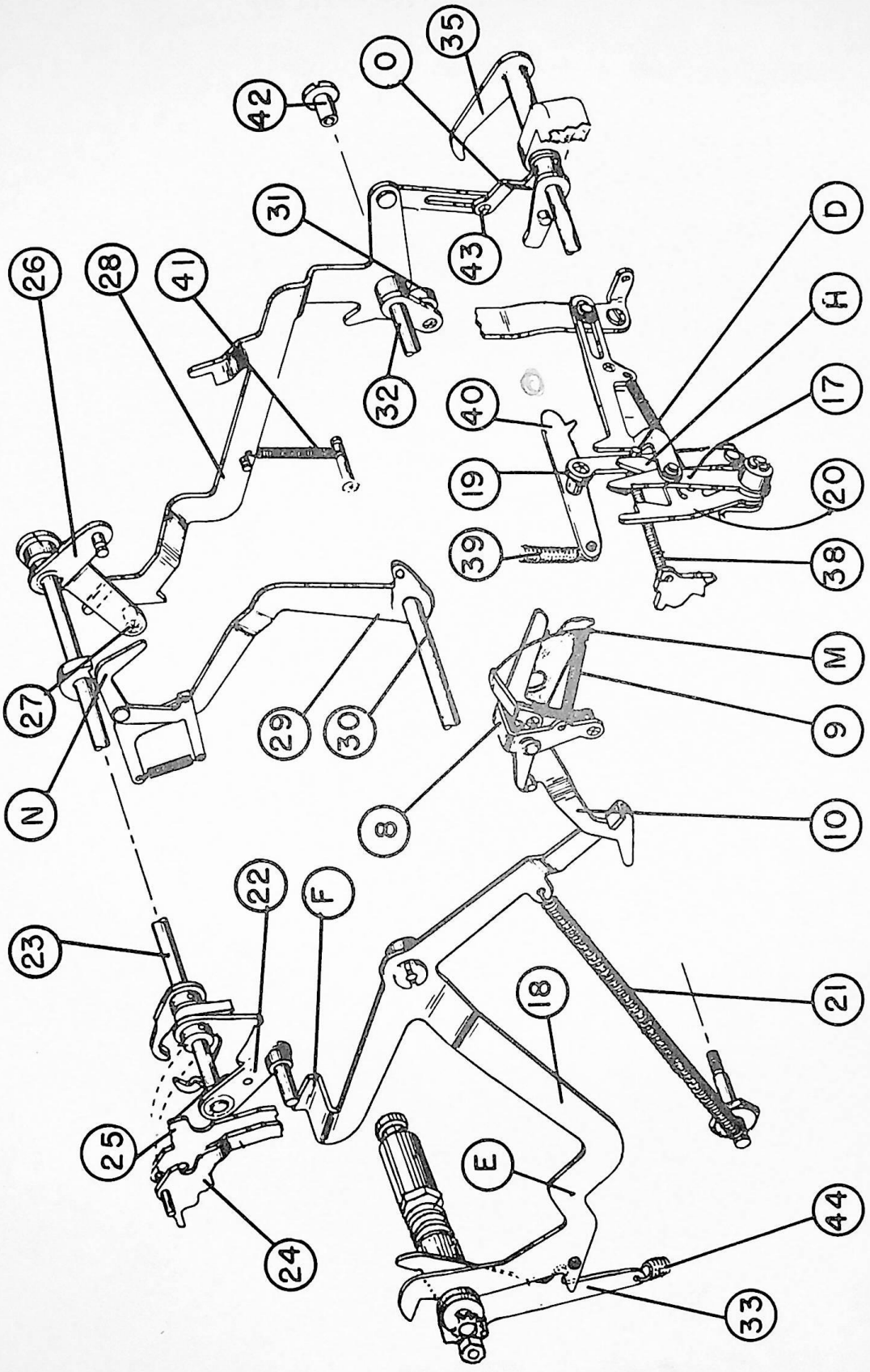



PLATE 5 SHORT CUT MULTIPLICATION

First Return Stroke

The item will be non-printed and added to add wheels. Backspace Cam (M) Plate 1 will rock Backspacer (14), backspacing a space out of Stop Section. As Backspace Drive Arm (19) Plate 5 moves to the right stud (D) will contact Short Cut Key Latch (17) unlatching Short Cut Key (1) Plate 4 and permitting Short Cut parts to restore. At the same time Short Cut Key Block Arm (20) Plate 5 will move under Short Cut Key (1) Plate 4 to prevent it being depressed while backspacing. As stud "G" Plate 1 of Backspace Cam (M) leaves hump (E) in Negative Multiply Operating Arm (18) the Arm will rotate under tension of Spring (21). Upper extension (F) of Negative Multiply Operating Arm (18) will contact and rotate Printing Hammer Catch Shaft (23). Short Cut Hammer (24) will be unlatched and regular M & Q Printing Hammer (25) will be blocked. The inner arm (26) on right side of Printing Hammer Catch Shaft (23) will raise Subtract Arm Operating Bail (12) Plate 2, Subtract Yield Arm (24) and Vertical Member of Subtract Slide. Right arm (27) Plate 5 will move to an overlatched position with Printing Hammer Catch Shaft Latch (28).

Second Forward Stroke

Accumulator Wheels revolve from add to subtract position. Backspace Cam (M) Plate 1 moves down and the Backspacer (14) moves to the front of the cam. Roll on stud "G" of Backspace Cam will contact Negative Multiply Operating Arm (18) Plate 5 relatching it with its latch (10). At this time the Printing Hammer Catch Shaft (23) will be held in a rocked position by Printing Hammer Catch Shaft Latch (28).

Second Return Stroke

The machine will print, add to Subtract Wheels and Backspace. As the machine backspaces the Printing Hammer Catch Shaft Release Arm (29) on right end of Backspace Shaft (30) will contact the Printing Hammer Catch Shaft Latch (28) unlatching Printing Hammer Catch Shaft (23). Printing Hammer Catch Shaft (23) will restore, permitting Subtract Arm Operating Bail (12) Plate 2, Subtract Yield Arm (24) and Vertical Member to restore. The regular M & Q Hammer (25) will be unlatched and Short Cut Printing Hammer (24) will be blocked.

Short Cut Significant Figure Stroke

When a significant figure is backspaced into Units column, the operation will be the same as previously described until the last return stroke. Instead of backspacing on last stroke the Stop Section will clear. Roll (31) on Reset Gear Shaft Extension (32) will contact Printing Hammer Catch Shaft Latch (28) unlatching Printing Hammer Catch Shaft (23).

Division bail will not rock on the first stroke if a sig figure in the stop section A will occur on the sec. stroke.

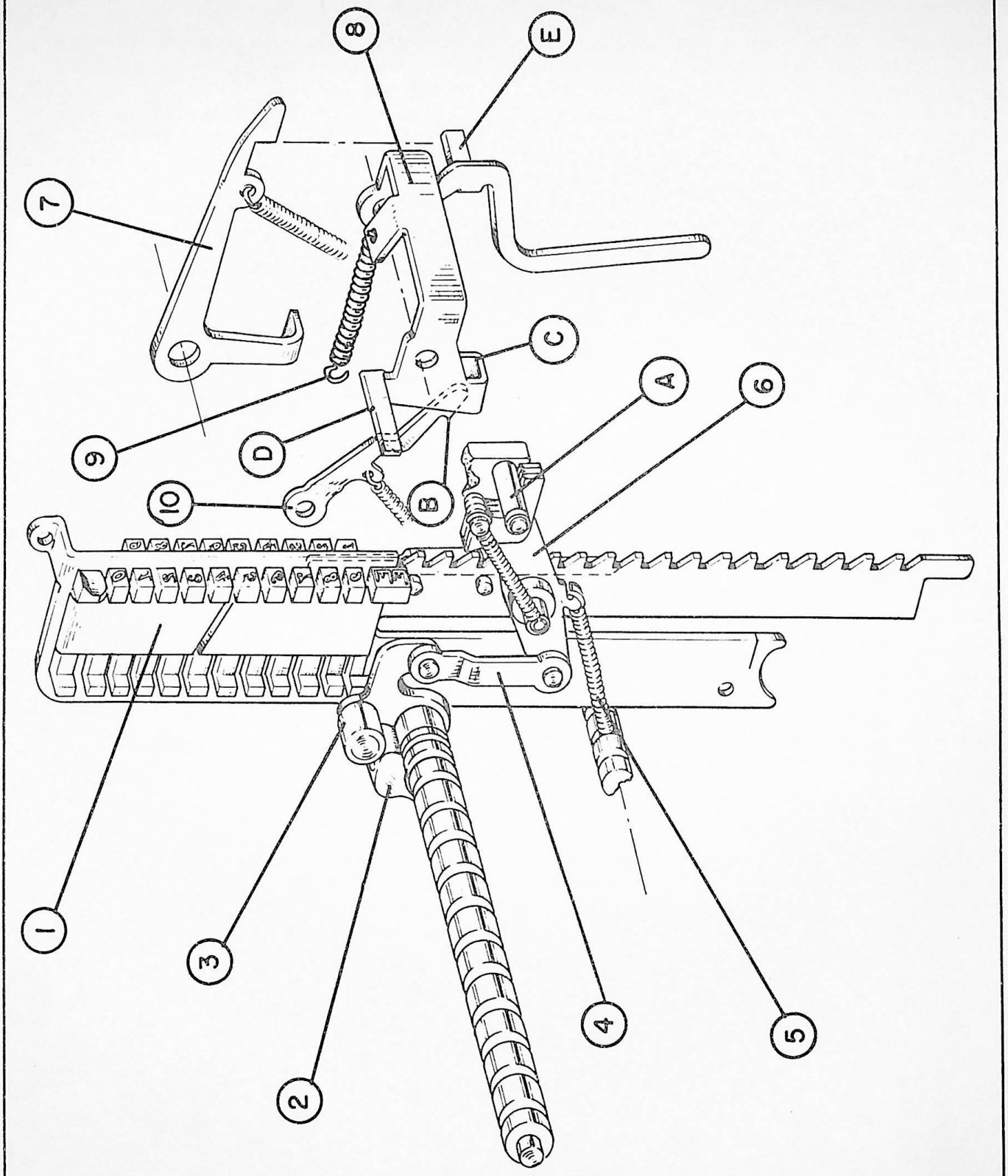



PLATE 6 M & Q FEED MECHANISM

## M & Q FEED MECHANISM

When the machine is in normal position the M & Q Rack (1) is in decimal printing position. As the Mainshaft moves forward, Type Carrier Operating Cam (2) will move forward permitting Roll (3) and Link (4) to follow through the tension of Spring (5). This will permit Type Carrier Operating Pawl (6) to move downward and engage teeth of M & Q Rack (1). Near the end of the forward stroke the Backspace Cam will release Lock Hook (7) from Retaining Pawl (8) and through the tension of Spring (9) Extension (D) will move into the teeth of M & Q Rack (1) to retain Rack after feeding up.

On the return stroke as the Mainshaft restores Cam (2) will drive Roll (3) rearward moving Link (4) downward pivoting Type Carrier Operating Pawl (6) and feeding M & Q Rack (1) up one space. Type Carrier Operating Pawl (6) will then contact roll on Stud (A) releasing Pawl (6) from teeth of M & Q Rack. This operation will continue on Multiplication or Division on every stroke of the machine while the machine is non-printing.

When a print stroke occurs, Release Hook (10) fastened to the Hammer Restoring Bail will move rearward. Extension (B) of Hook (10) will engage Extension (C) of Pawl (8). On the return stroke Release Hook (10) will rotate Pawl (8) moving Extension (D) out of M & Q Rack and latching Extension (E) with Lock Hook (7). The M & Q Rack will restore as roll on Stud (A) releases Pawl (6) from teeth of M & Q Rack.

EXTENTION ON RECEASE HOOK WILL CONTACT HUB OF HAMMER RESTORING BAIL RAISING IS ABOVE C.

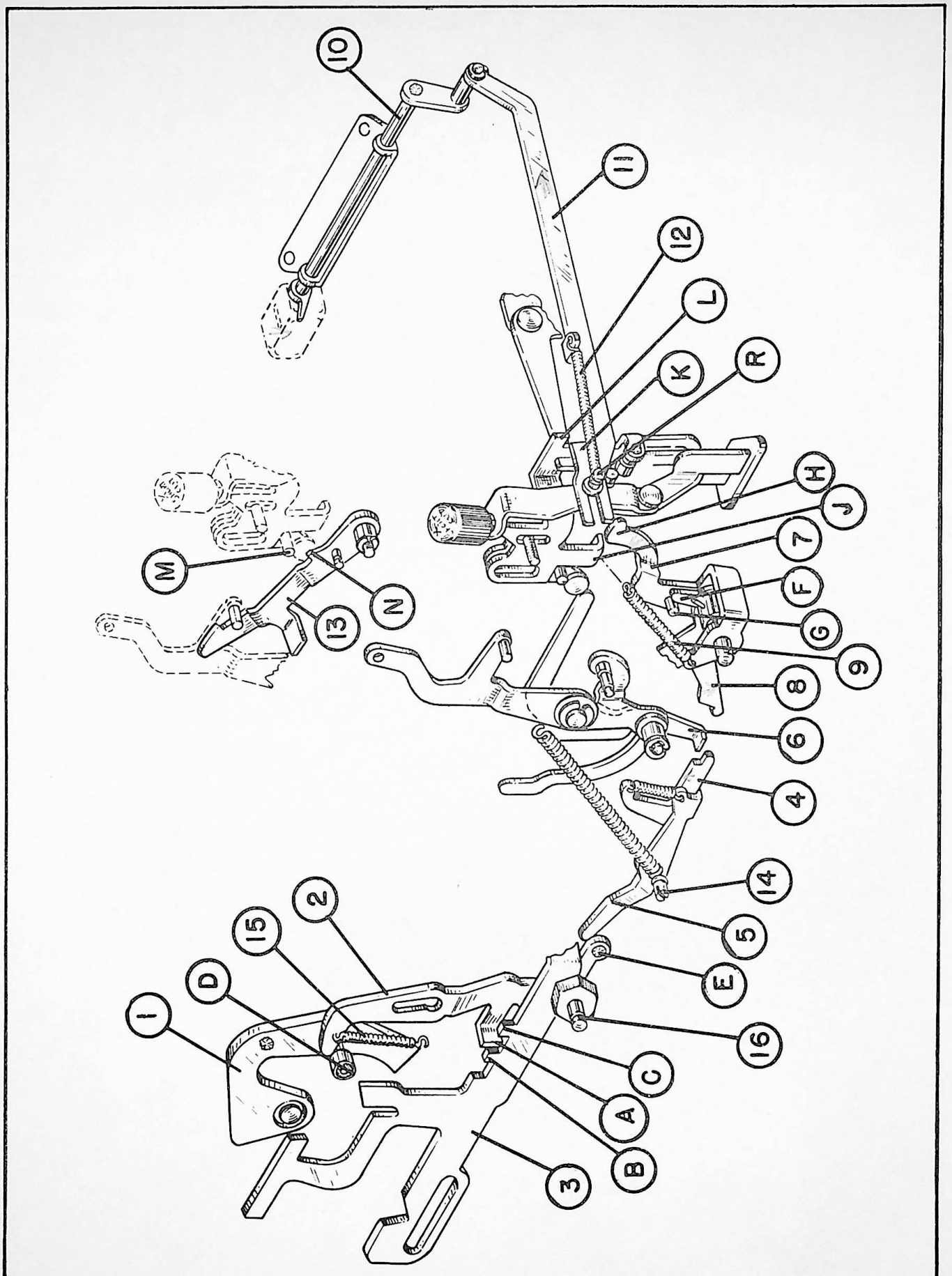



PLATE 7 INTERLOCKS

## INTERLOCKS

A. Dial Rack Raising Arm Slide Lock Arm (2).

The purpose of the Dial Rack Raising Arm Slide Lock Arm (2) is to block the Dial Rack Raising Arm Slide (3) while the mainshaft is out of normal position to prevent the operator from restoring and operating the Multiply Lever while the machine is in operation.

If the Multiply Lever is pushed to the rear, Backspace Cam (1) will move down and permit Extension (A) of Lock Arm (2) to drop behind Step (B) of Slide (3) and prevent Slide (3) from being restored until near the end of the cycle when Stud (D) of Backspace Cam (1) will restore Lock Arm (2).

If the Multiply Lever is pulled forward, Extension (A) will drop in front of Step (C) to block Slide (3).

B. Short Cut Key Block Arm (4).

The purpose of Short Cut Key Block Arm (4) is to prevent Short Cut Key being depressed while the mainshaft is out of normal.

As the Backspace Cam (1) moves down, Stud (D) will permit Lock Arm (2) to move down. Stud (E) will release Yield Arm (5) permitting the forward portion of Block Arm (4) to move up and block Backspace Control Pawl Lever (6) and in turn blocking Short Cut Key. At the end of the cycle, Stud (D) of the Backspace Cam (1) will restore Lock Arm (2), Yield Arm (5) and Block Arm (4).

C. Short Cut Key Block Arm (7)

The purpose of Short Cut Key Block Arm (7) is to block the Short Cut Key when the Multiply Lever is operated to the front or rear.

As the Multiply Lever is operated and Arm (8) moves downward, Extension (F) of Arm (8) will contact Stud (G) of Arm (7) positioning Extension (H) under Extension (J) to block the Short Cut Key. As Arm (8) restores moving Stud (G) away from Extension (F), Spring (9) will restore Block Arm (7).

D. Subtract Key Interlock

The purpose of the Subtract Key Interlock is to prevent the Subtract Key and Short Cut Key from being operated at the same time.

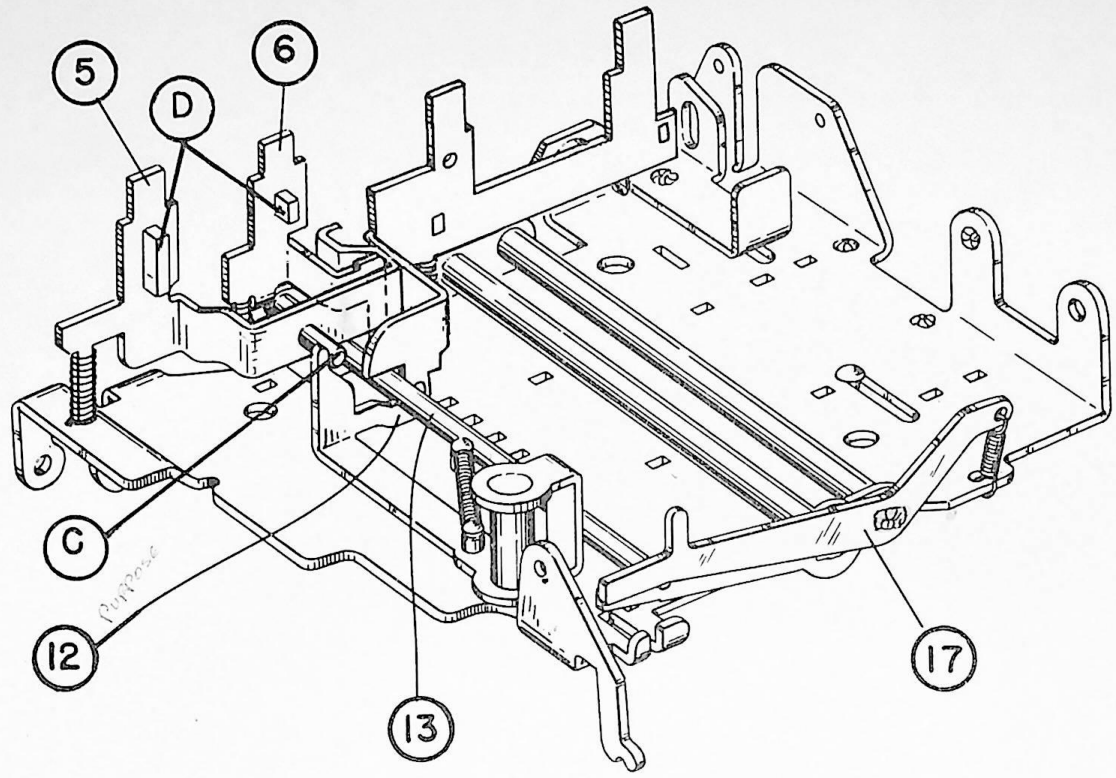
As the Subtract Key is depressed, Shaft (10) will move Link (11) to the right and position Extension (K) in the path of Extension (L) to prevent the Short Cut Key being depressed. As the Subtract Key restores, Spring (12) will restore Link (11) and Shaft (10).

As the Short Cut Key is depressed, Extension (L) will move into the path of Extension (K) and through Link (11) and Bail (10) will prevent depression of the Subtract Key.

E. Multiply Lever Interlock

The purpose of the Multiply Lever Interlock is to prevent Multiply Lever being operated to the front when the Short Cut Key is depressed.

As the Short Cut Key is depressed, Stud (M) will move into the path of Extension (N) of the Non-Add Drive Pawl (13). The Multiply Lever will be prevented from moving forward by extension (N) contacting Stud (M).



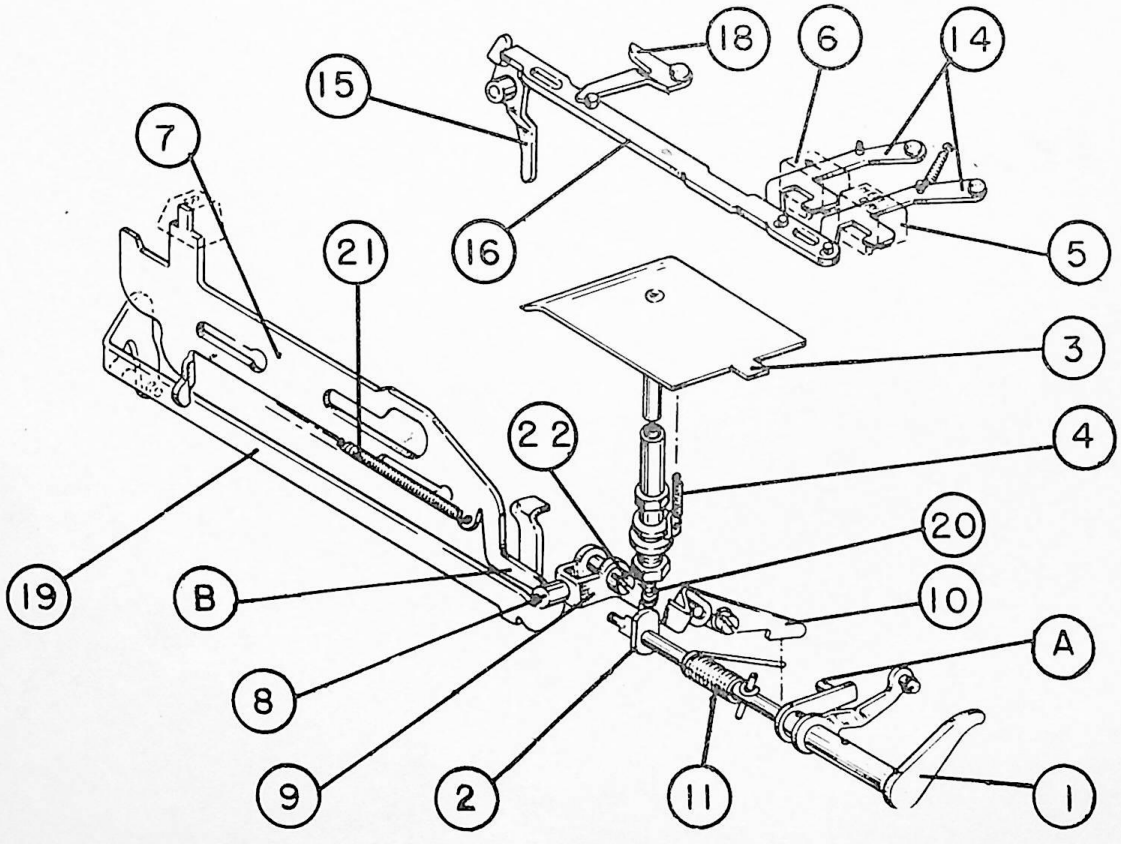




PLATE 8 CONSTANT LEVER

## CONSTANT LEVER, SPACE KEY AND MEMORY KEY

Plate 8

The purpose of the Constant Lever (1) is to permit a factor to be multiplied consecutively by different multipliers.

As the Constant Lever (1) is pulled forward, Lifting Cam (2) will permit Stop Restoring Plate (3) to lower through tension of Spring (4) so that Stops will not be restored when Stop Section restores. Constant Lever (1) will be held in a forward position by Stud (A) latching with Latch (10). Upon completion of each problem, the original multiplicand may be replaced in the machine by depressing the Memory Key (5). When it is desired to restore the Stops in the Stop Section, the Backspace Slide (7) should be moved to the extreme right. This will cause Extension (B) to contact Roll (8) and through Arm (9) will release Latch (10) from Stud (A). Constant Lever (1) will restore through tension of Spring (11) causing Lifting Cam (2) to raise Stop Restoring Plate (3).

The purpose of the Space Key (6) is to index spaces to the right of the Multiplicand or Dividend. By depressing the Space and Memory Keys simultaneously the Stop Section will move all the way to the left entering all spaces to the right of the Multiplicand or Dividend.

As the Space Key (6) is depressed, the beveled edge of the Space Key Tappet will move into the path of the Space Stops. As the Memory Key (5) is depressed Stud (C) will cam the Universal Bar Limit Plate (12) to the right so that the Universal Bar (13) can move down and limit on the lower keyboard plate. This will lower the fixed dog below Escapement Rack and allow the Stop Section to move to the left with the Space Key Tappet camming down the Space Stops. Space and Memory Keys will be latched down by Key Stem Lock Plates (14) latching over Lug (D). As the Stop Section nears the end of its travel to the left it will contact Lock Plate Link Bellcrank (15) and in turn move Lock Plate Link (16) to the right unlatching the Space and Memory Keys.

The purpose of Auxiliary Universal Bar (17) is to operate Numeral Keylock and block Mainshaft when backspacing manually. Also to prevent backspacing manually when Mainshaft is in operation.

The purpose of Bellcrank (18) is to release the Space and Memory Keys by pulling the Release Key if for any reason the Stop Section failed to move to the left far enough to release them through Bellcrank (15) and Link (16).

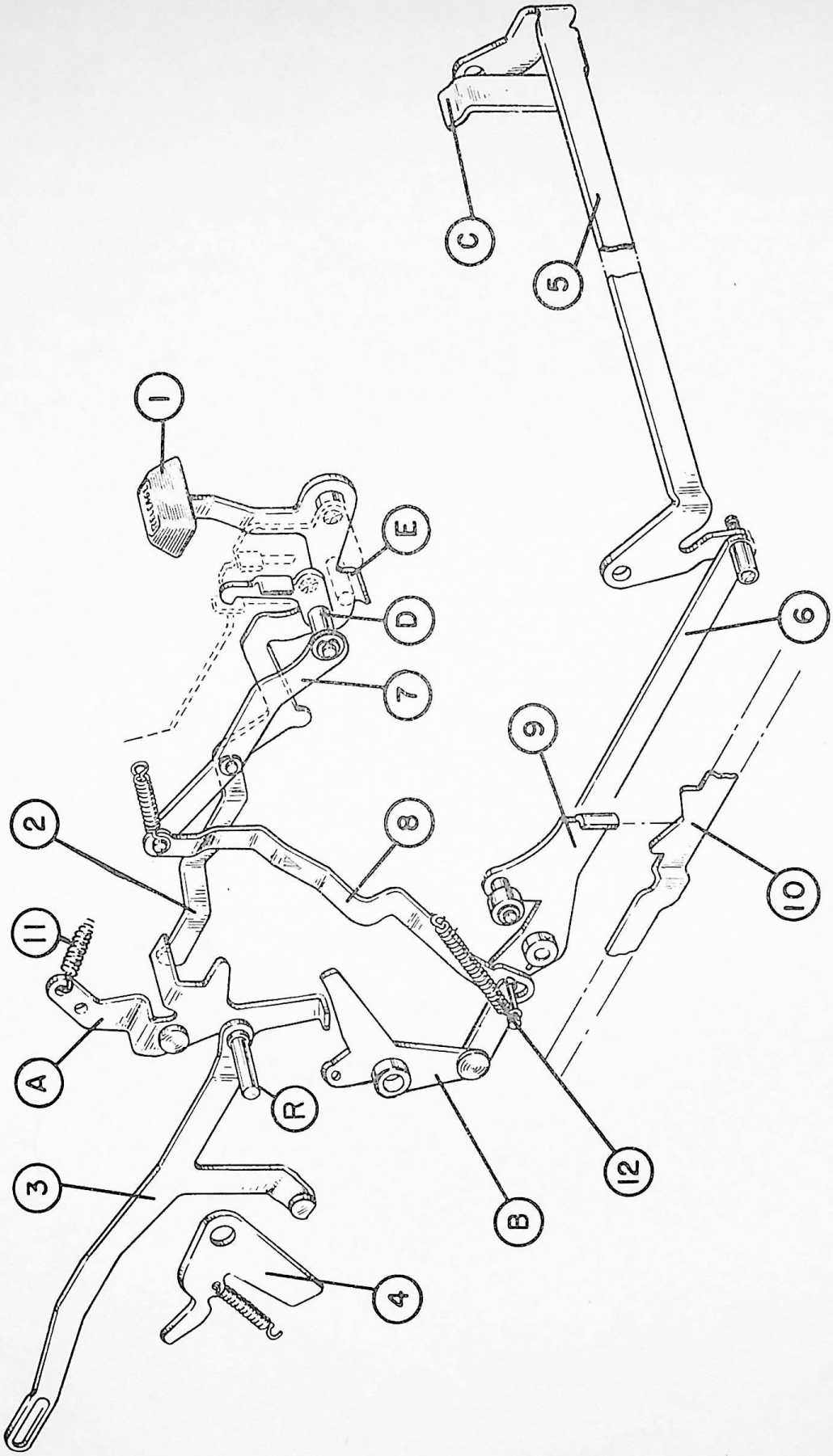



PLATE 9 RELEASE KEY MECHANISM

## RELEASE KEY MECHANISM

Plate 9

During Multiplication when more spaces have been added to the Multiplicand than is required by the Multiplier which may be the case if the operator is using Constant Multiplication and spacing the Stop Section all the way to the left, the Release Key may be used before the last multiplier to cause the machine to take an automatic blank stroke and total without backspacing all the spaces out of the machine.

As the Release Key (1) is operated, Extension (2) will move upward contacting lip of Arm (A) placing arm (A) in front of Latch (B) and moving Link (3) to the front to permit Inner Pawl (4) to latch the Backspacer and permit Stop Section to clear. As the Stop Section restores Bellcrank (5) will rotate forward moving Link (6) rearward and restore Latch (B), Arm (A), Link (3) and Inner Pawl (4).

On Division if it is desired to stop the machine before all spaces are backspaced from the Divisor, the Release Key may be used and the machine will automatically take a blank stroke and total. The positioning and restoring of parts being the same as for multiplication.

The Release Key may also be used to release the Multiply Lever if for any reason the Multiply Lever was latched to the front or rear without tripping the motor. As the Release Key (1) is operated Extension (E) will contact Arm (D) pivoting Link (7) and in turn moving Link (8) downward to unlatch Feature Key Latch (9) from Dial Rack Raising Arm Slide (10).

ELECT

NON ELECT

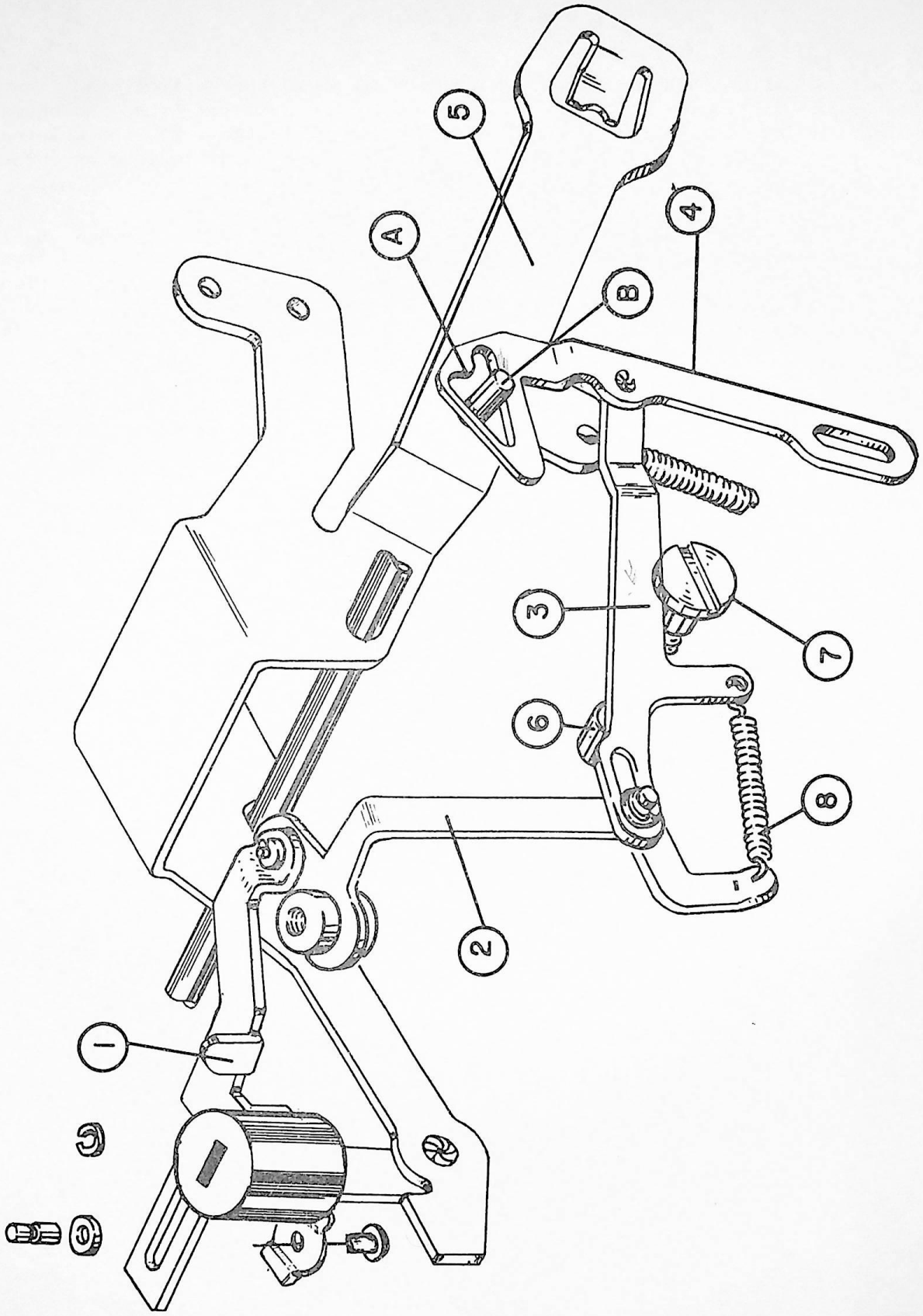



PLATE 10 SUBTRACT CONTROL MECHANISM

## SUBTRACT KEY CONTROL MECHANISM

Plate 10

The Subtract Key may be electrified or non-electrified as the operator desires.

With Subtract Control Slide (1) to the left, Arm (2) and Link (3) will hold Dwell (A) of Arm (4) in position to permit Stud (B) of Subtract Arm (5) to move up into the elongated portion of Dwell (A) as the Subtract Key is depressed and Arm (5) operates. This will prevent Arm (4) raising and tripping the motor. The operator would trip the motor by using the Add - Total Bar or by using the Multiply Lever to do Subtract Multiplication as in discount.

To electrify the Subtract Key, move Slide (1) to the right, through Arm (2) and Link (3), Arm (4) will move forward positioning narrow portion of Dwell (A) over Stud (B). As Arm (5) operates when the Subtract Key is depressed, Stud (B) will raise Link (4) and in turn trip the motor.

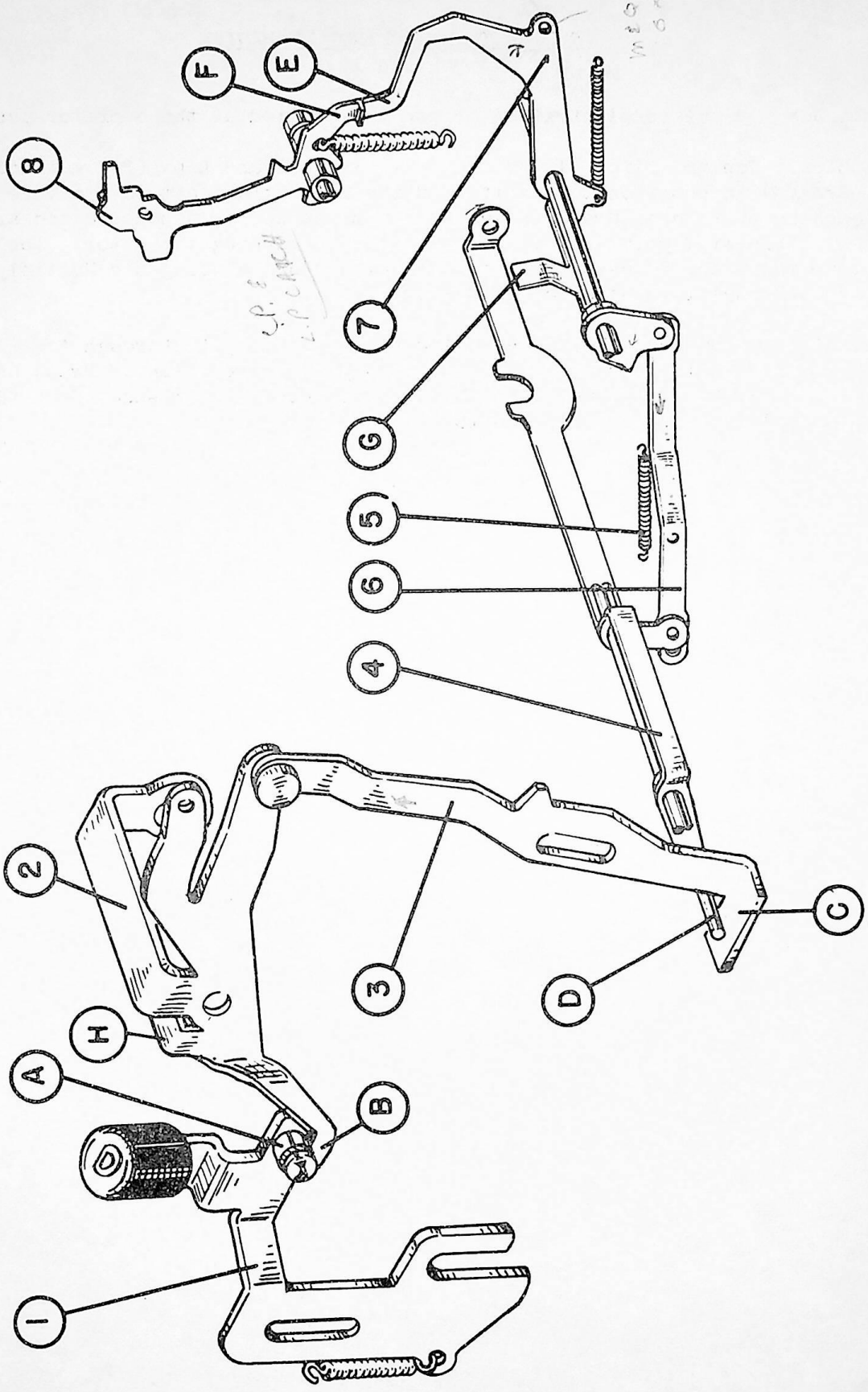



PLATE II DECIMAL KEY MECHANISM

## DECIMAL KEY MECHANISM
Plate 11

The Decimal Key is used for printing the decimal in the quotient of a division problem, also for doing discount multiplication.

As the Decimal Key (1) is depressed, Roll (A) contacts Extension (B) of Decimal Operating Bail (2) rotating Bail (2) counterclockwise and raising Link (3) to latch on Feature Key Latch. Extension (C) of Link (3) contacts Stud (D) rotating Bail (4). Spring (5) will pull Link (6) to the front and rotate Print Hammer Block Arm (7) to the rear. Extension (E) of Arm (7) will move to the rear out of blocking position of Extension (F) of M & Q Hammer (8) permitting Hammer to print decimal. Near the end of the operation Feature Key Latch will release Link (3) permitting all parts to restore.

For doing Discount Multiplication, Bail (34), Plate 4 will also operate Link (37) Plate 4 moving Pawl (13) to the rear to hold Outer Pawl (14), Long Pawl (15) and Long Pawl Latch (16) to the rear to permit backspacing on the first operation.

WHEN M & Q IS RAISED, "E" MOVES TO THE FRONT OF "F"

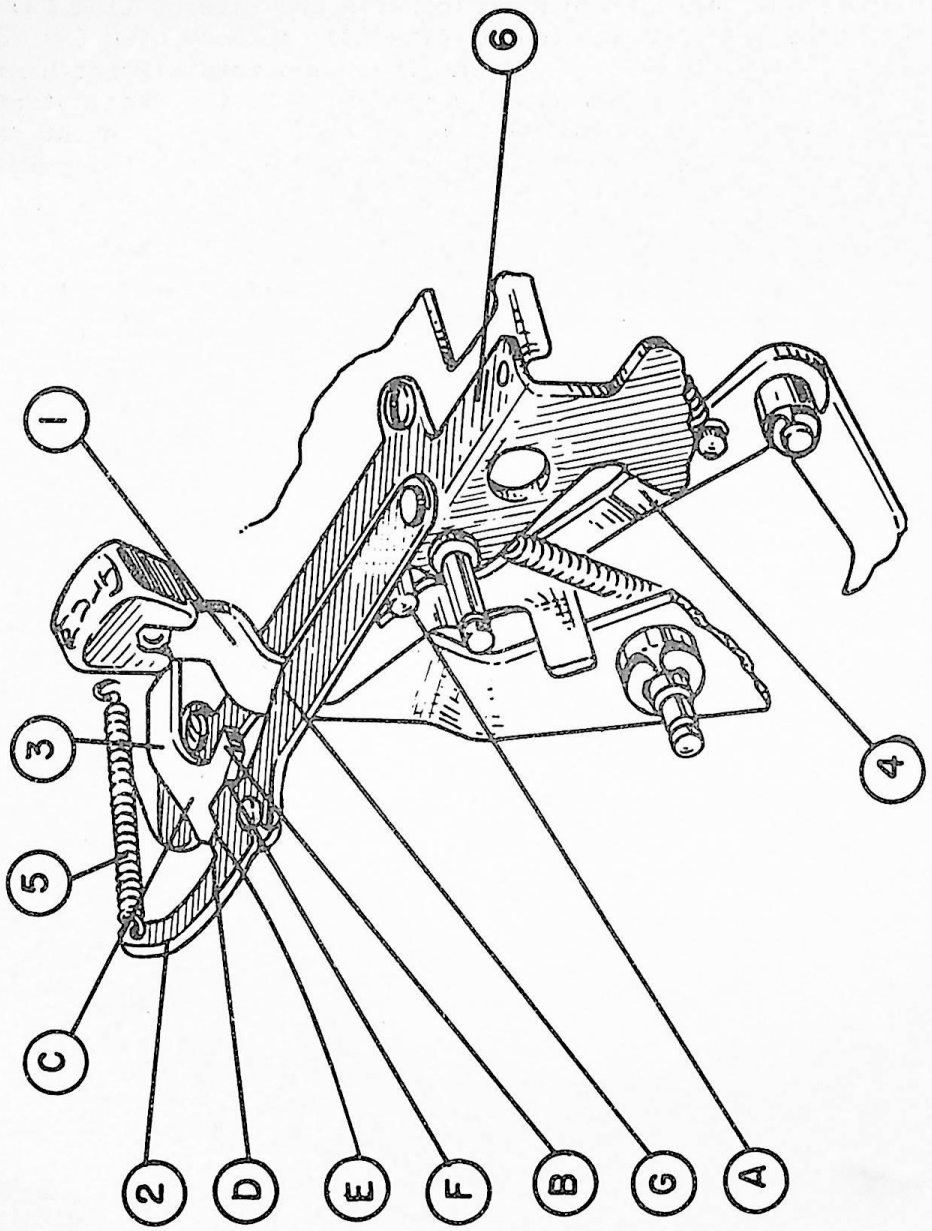



PLATE 12 MULT. LEVER FULL STROKE PAWL

## MULTIPLY LEVER FULL STROKE PAWL

Plate 12

The purpose of the Multiply Lever Full Stroke Pawl (2) and the Multiply Lever Full Stroke Pawl Latch (3) is to prevent Multiply Lever (1) being operated to the rear until it has restored far enough for Non-Add Drive Pawl (4) to relatch on Stud (A). If Non-Add Drive Pawl, (4) did not relatch, the first operation of the Multiplier would be added instead of Non-Added.

As the Multiply Lever (1) is pushed rearward the rear portion of the Lever will contact Extension (B) of Latch (3) moving Latch (3) rearward and permitting Extension (C) to move into step (D). At this time the rear portion of Multiply Lever (1) will be beyond step (F) of Pawl (2) and Lever (1) may be operated to rear. On the return stroke of Lever (1), step (F) will move into the path of the Lever and prevent Lever being operated to the rear until forward portion of Lever (1) contacts camming surface (G) and drives Pawl (2) to the left permitting Extension (C) to move into Step (E). This will hold step (F) out of path of Lever (1) and Non-Add Drive Pawl (4) will have relatched with Stud (A). Multiply Lever (1) will now be free to be operated to the rear.

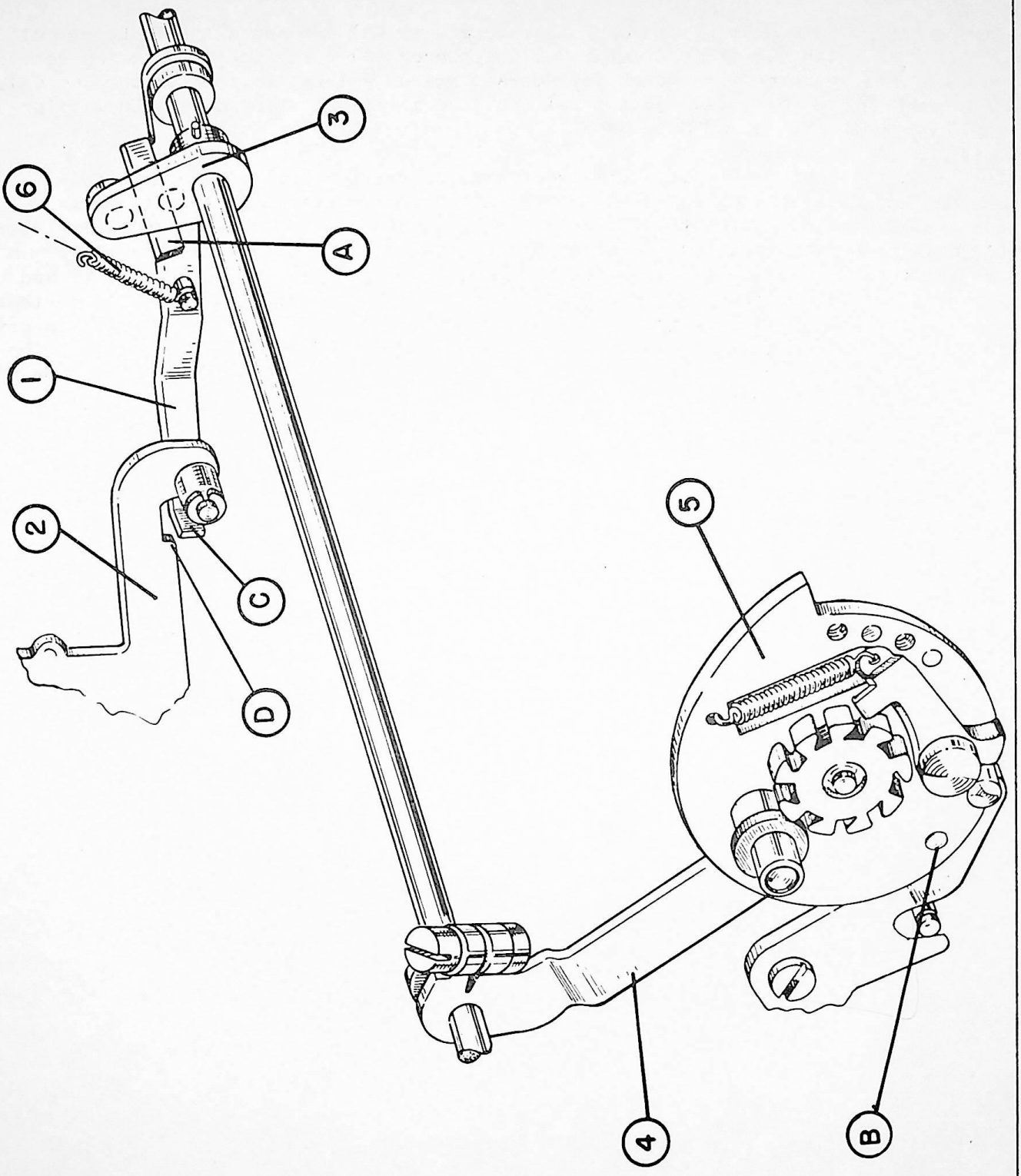



PLATE 13 TOTAL SLIDE LOCK ARM

## TOTAL SLIDE LOCK ARM
Plate 13

The purpose of the Total Slide Lock Arm is to prevent the Total Slide from moving rearward on the return stroke of a blank stroke operation during a division problem when the Total Lock Cam on the mainshaft releases the intermediate roll of the Total Slide. If the Total Slide was permitted to move to the rear at this time, the fork of the Total Slide would rock the Feature Key Latch permitting the Automatic Remainder Link to restore and stop the machine at the end of the blank stroke.

Machine normal, Extension (C) of the Total Slide Lock Arm (1) is held clear of dwell (D) of the Total Slide (2) by Extension (A) resting against Arm (3) of the Hammer Trip Shaft. As the Motor Drive Crank (5) operates, stud (B) will contact Arm (4) moving Arm (3) rearward away from Extension (A). This will permit Spring (6) to position Extension (C) into Dwell (D) of the Total Slide (2) just before the Total Lock Cam releases the intermediate roll of the Total Slide to prevent the Total Slide (2) from moving rearward.

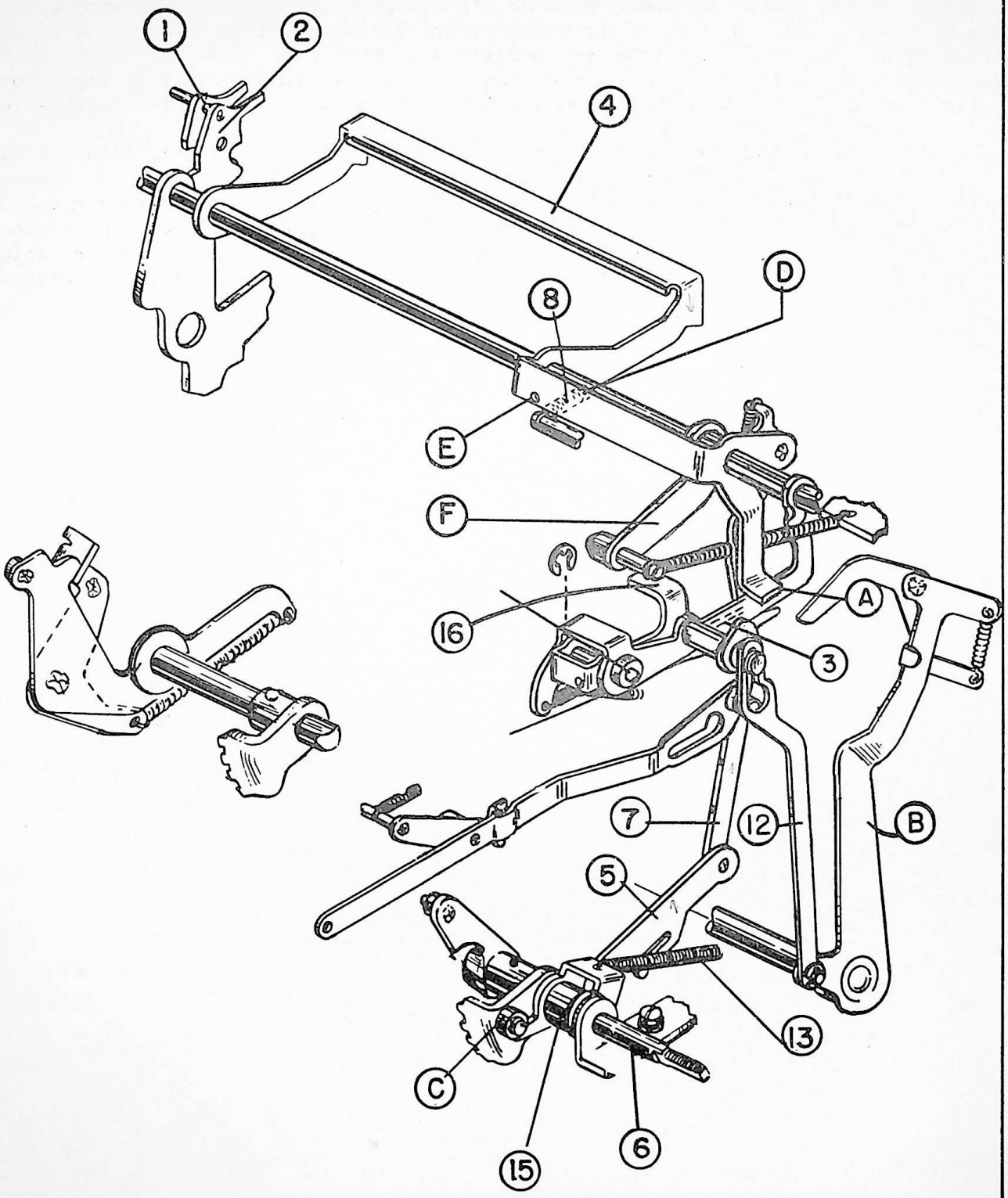



PLATE 14 PRINTING CONTROL MECHANISM

MODELS 94 & 98 INSTRUCTIONS

PRINTING CONTROL FEATURE

SIMPLA-TAPE

Plate 14

The Printing Control Feature eliminates the repeat printing of the Divisor during a division problem or the Multiplicand during a multiplication problem. After the Backspacer operates on the first print operation of either a multiplication or division problem, the Multiply and Division Non-Print Bail (4) will be released to drop down and limit on the extensions of the Hammer Guide Comb to prevent any further Divisor or Multiplicand print until the Stop Section restores. This eliminates all repeat print on the tape with the exception of the M & Q figures, and Non-Add character when multiplying by zero.

When the machine is normal, Latch (3) holds the Multiplier and Division Non-Print Bail (4) up out of the path of the Printing Hammers for regular print operations. During regular multiplication or division, as Arm (B) operates on the first backspace operation, Link (12) will be lowered at the same time pulling Latch (3) down and releasing it from Lip (A) of Bail (4). This will permit Bail (4) to drop through Spring (8) to block the Printing Hammers. Bail (4) will remain down until the Stop Section restores. Roll (C) on the Reset Gears will contact the forward extension of Arm (5) rotating Arm (5) and through Link (7) will restore Bail (4) permitting Latch (3) to relatch Lip (A).

If the first Multiplier is a Short Cut Multiplier, the machine will backspace on the first return stroke before a print operation takes place. Therefore, it is necessary to prevent Bail (4) from dropping at this time. This is accomplished by Latch (16) moving up to block Lip (A) of Bail (4) as Arm (F) of the Printing Hammer Catch Shaft is raised on the first return stroke. At the same time Arm (B) and Link (12) will lower Latch (3) and Lip (A) will become latched with Latch (16). After printing on the last return stroke of this operation as the machine backspaces and the Printing Hammer Catch Shaft restores, Arm (F) will lower Latch (16) permitting Bail (4) to again drop and remain down until the Stop Section restores.

Spring (8) may be unhooked from Hole (D) and hooked to hole (E) to make the Multiply and Division Non-Print Bail (4) inoperative while servicing a machine.

The Backspace Drive Arm (19), Plate (5), is now of two part construction so that use of the Manual Backspace Slide will not cause Latch (3) to release Bail (4) to block the hammers. The Backspace Drive Arm Short is clamped to the Shaft and when operated will pick up the stud in the Backspace Drive Arm Long to operate the Backspace Pawl (40) and Stop Section in normal manner. The Manual Backspace Slide operates only the Backspace Drive Arm Long (19).

Why does it not stay out of the way on [illegible]

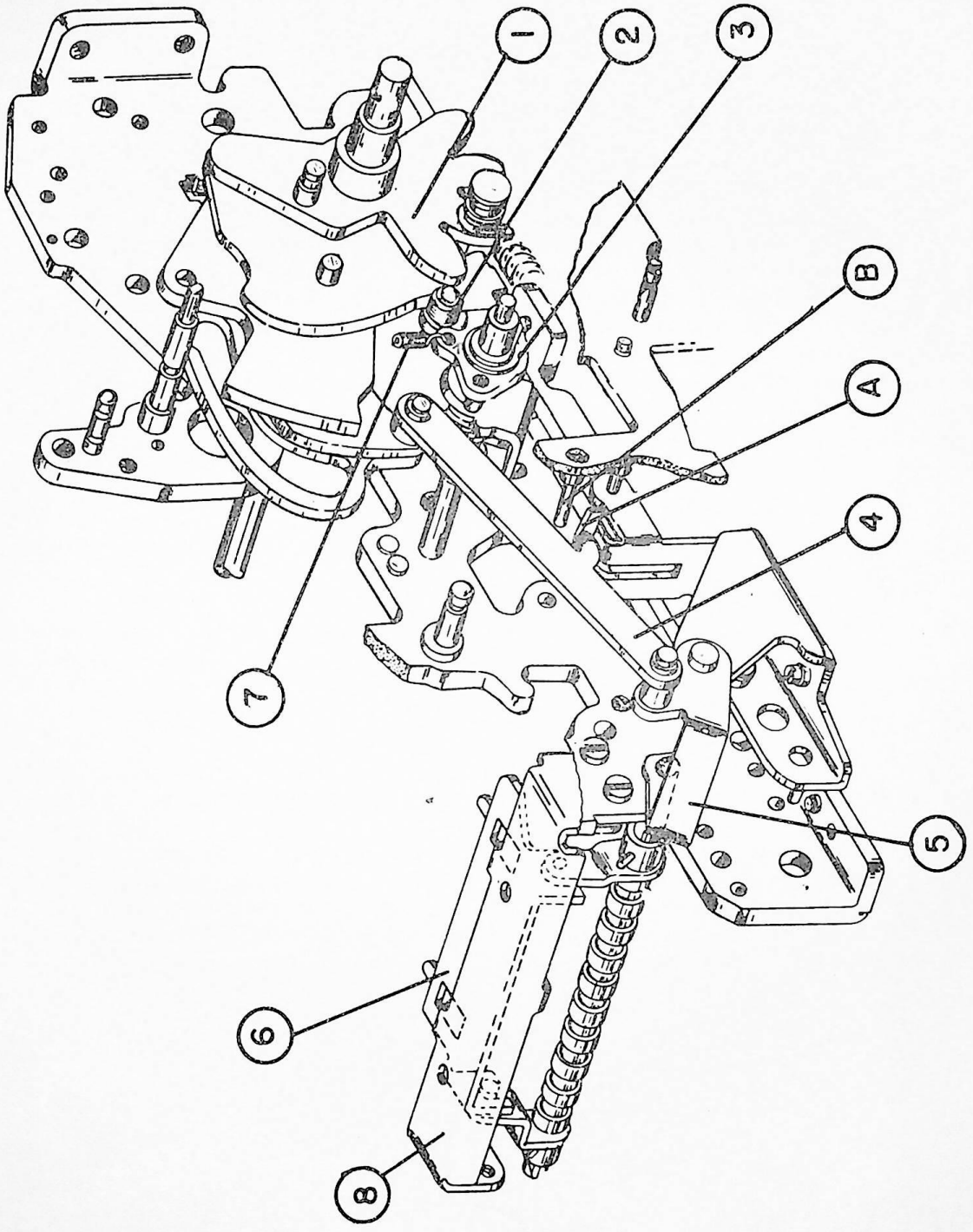



PLATE 15 POSITIVE RESTORING MECHANISM

## POSITIVE RACK RESTORING MECHANISM

Plate 15

The purpose of the Positive Rack Restoring Mechanism is to restore the Accumulator Racks from carry position when the Accumulator Rack Heels are limiting against the space stops.

As the Mainshaft moves forward the Mainshaft Drive Plate (1) contacts Roll (2) actuating Rack Restoring Actuator Bellcrank (3). This in turn moves Rack Restoring Actuator Link (4) to the rear until Lip (A) limits against Stud (B) in the side frame. As Link (4) moves rearward, Rack Restoring Actuator Assembly (5) is operated causing Rack Restoring Plate (6) to move to the rear and contact the upright portion of the Accumulator Racks pushing them to the rear and permitting the Carry Pawls to restore. On the return stroke all parts will be restored to normal through the tension of Spring (7).

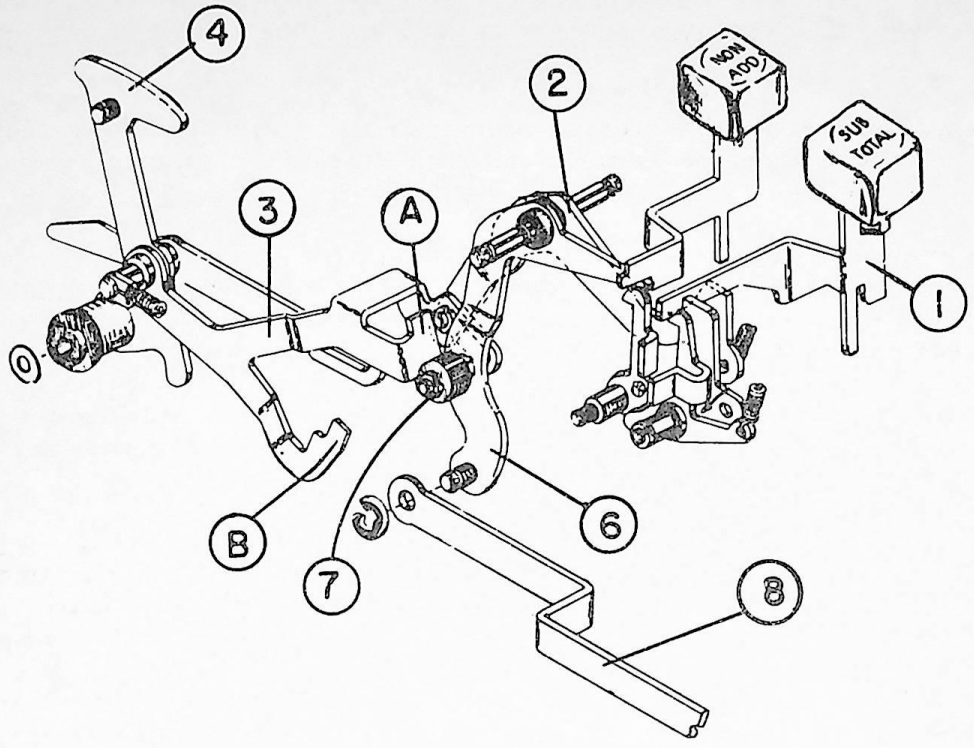
NEW STYLE

All machines ~~with Positive Rack Restoring Mechanism~~ have .015 ground off the face of the Cipher Stops. ~~This is necessary to obtain lug clearance since the Accumulator Rack Slides do not engage with the Scatter Lugs when in zero position.~~

All machines with Positive Rack Restoring Mechanism also have High Speed Mechanism. This mechanism includes redesigned Accumulator Racks, Accumulator Rack Restoring Shaft Assembly and the addition of a roller assembly between the Center Frames to cam the Accumulator Rack Slides off the Scatter Lugs.

FOR MODELS 94-98

~~On machines with High Speed Mechanism~~, the low speed is 150 strokes per minute and high speed 180 strokes per minute.



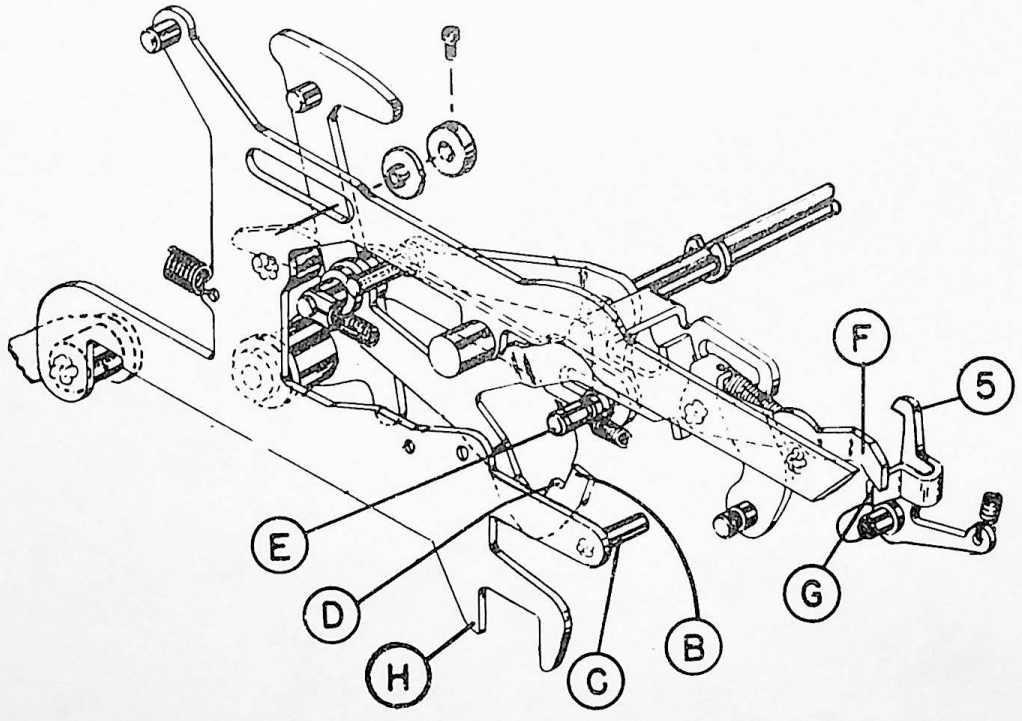




PLATE 16 NON-ADD & SUB-TOTAL MECHANISM

## NON-ADD AND SUB-TOTAL MECHANISM

Plate 16

The Sub-Total Key may be latched down at any time. If latched down during a multiplication problem, the machine will take an automatic blank stroke and Sub-Total at the end of a problem.

As the Sub-Total Key (1) is depressed, Sub-Total Bellcrank (2) will raise Non-Add and Sub-Total Link (3) positioning Extension (B) in the path of Stud (C) of the Total Slide. As the Total Slide moves to the rear, Stud (C) will contact Extension (B) and position the Non-Add Cam Lock Lever Assembly (4) to the rear of the Total Cam. As the same time, Step (D) will contact Stud (E) and position the Character Selector Shaft for the "S" Symbol to print. When the machine is normal, Pawl (F) rests on top of Lip (G). As the Total Slide moves rearward, Pawl (F) drops in back of Lip (G) of Sub-Total Key Latch (5). As Total Slide restores Pawl (F) will push Lip (G) forward and unlatch Sub-Total Key.

Depressing the Non-Add Key rotates Non-Add Bellcrank (6). Roll (7) contacts Lip (A) of Non-Add and Sub-Total Link Assembly (3) and in turn positions Non-Add Cam Lock Lever Assembly (4) to the rear of the Total Cam. At the same time positioning the Character Selector Shaft for the "V" Symbol to print.

On machines with latch down Sub-Total Mechanism, the inside flange of the Total Cam is shorter to permit the Non-Add Cam Lock Lever Assembly (4) to be positioned later as is the case when being driven to the rear by the Total Slide.

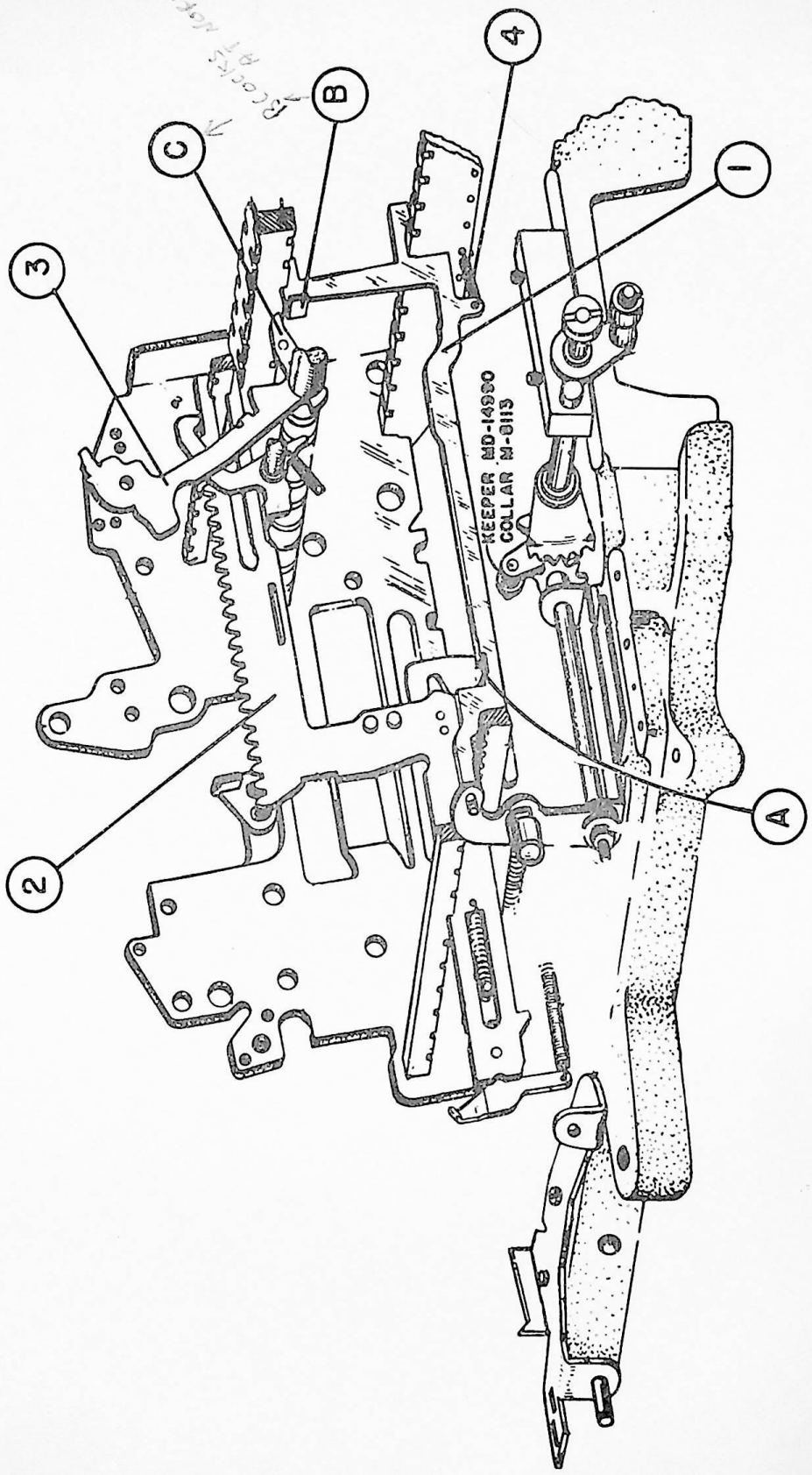



PLATE 17 HAMMER RETAINING SLIDES

## HAMMER RETAINING SLIDES
Plate 17

The purpose of the Hammer Retaining Slides (1) is to prevent ciphers from printing to the right of a Multiplication or Division problem.

Machine normal, Extension (A) of Accumulator Rack (2) holds Slide (1) to the front of the machine positioning Extension (B) in the path of Extension (C). With Space Stops in the Stop Section Accumulator Rack (2) will not move to the rear far enough to permit Extension (B) to move out of the path of Extension (C). Therefore Extension (C) will limit on Extension (B) as the Hammer (3) fires and prevent printing.

When a figure other than a space is entered in the Stop Section and the Accumulator Rack moves to the rear, Extension (A) will move to the rear permitting Spring (4) to move Slide (1) to the rear moving Extension (B) out of the path of Extension (C) to permit printing to take place.

It is very important that the Hammer Retaining Slides (1) are perfectly free. A binding Slide would prevent Spring (4) from moving Extension (B) out of the path of Extension (C) when a figure other than a space is entered in the machine and in turn prevent printing. Trouble of this nature could very easily be confused with Hammer Latch trouble. When printing troubles are encountered it is suggested that Hammer Retaining Slides be checked for free before making any other adjustments.

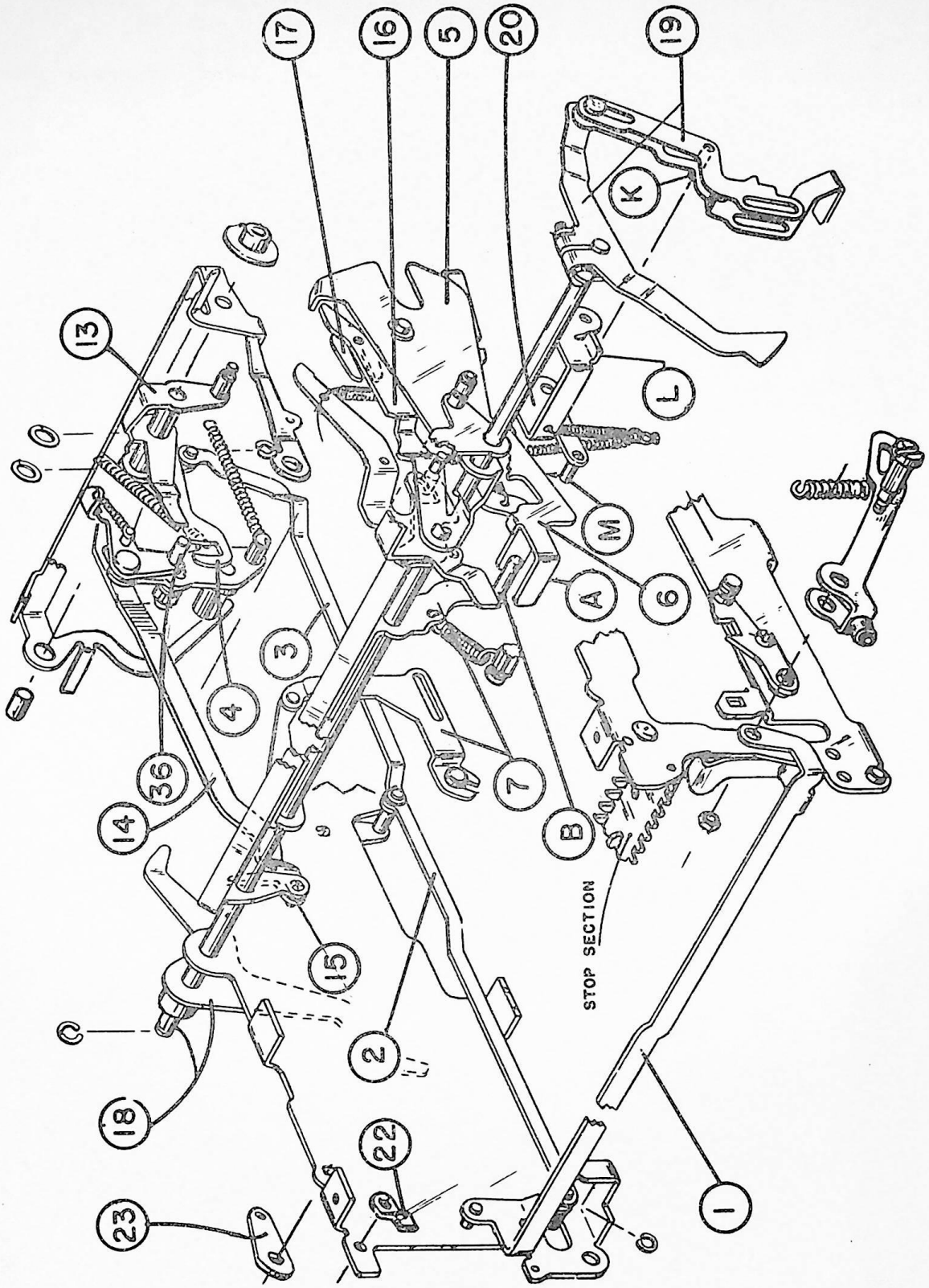



PLATE 18 CREDIT BALANCE MECHANISM

MODELS 94 & 98 INSTRUCTIONS
CREDIT BALANCE OPERATION
POSITIVE TO NEGATIVE OPERATION
Plate 18 and 19

Machine normal, enter item in Stop Section and depress the Subtract Key. As the item is entered into the Stop Section, the Blank Stroke Lock Bell Crank (1) Plate 18 will rotate pulling Links (2) and (3) to the front of machine. This will position the Negative Total Block Arm (Outer) (4) to block stud (36) in the Negative Total Link Operating Arm Pawl.

As the Main Shaft moves forward, the Subtract Slide (5) plate 19 will move to the rear. Extension (A) of the Subtract Slide Pivot Pawl (6) will contact Stud (B) of the Credit Balance Bell Crank Pawl Lift Arm (7). The left extension of Lift Arm (7) will raise the Bell Crank Pawl (C) positioning its upper extension (D) behind the upper Stud (E) of the Credit Balance Operating Bell Crank (8). When a complete carryover occurs and the Credit Balance and Motor Control Slide (9) moves to the front of machine into carry position, it will cause Bell Crank Pawl (C), fastened to it, to rotate the Credit Balance Operating Bell Crank (8) counter clockwise. This in turn will rotate the Credit Balance Carry Pawl Cam Assembly (10) to the rear, causing its right arm (F) to cam down the first Carry Pawl (11) to accumulate the "Automatic One". At the same time Cam Assembly (10) rotates, the Negative Total Block Arm Link (12), connected to it, will move to the front of the machine. This will cause the Negative Total Block Arm (Inner) (13) Plate 18 to move up out of the path of the Stud (36) on the Negative Total Link Operating Arm Pawl.

As the Stop Section restores, the Blank Stroke Lock Bell Crank (1) will cause Links (2) and (3) to move to the rear lowering the Negative Total Block Arm (outer) (4) out of the path of the stud on the Negative Total Link Operating Arm Pawl. The machine is now in a Negative position, indicating more has been subtracted from the machine than was added.

NEGATIVE TO POSITIVE OPERATION

To bring the machine back to a positive position, it will be necessary to add a larger item than was subtracted.

As this larger item is entered in the Stop Section, the Blank Stroke Lock Bell Crank (1), Plate 18 will again rotate causing links (2) and (3) to move to the front positioning the Negative Total Block Arm (outer) (4) in the path of the Stud (36) on the Negative Total Link Operating Arm Pawl. This will prevent the pawl from operating the Subtract mechanism and permit the Accumulator Wheels to revolve back to add position. When the Subtract Slide (5) moves forward, Extension (G) Plate 19 of the Slide will contact Stud (B) moving it to the front and causing the Credit Balance Bell Crank Pawl Lift Arm (7) to lower the Bell Crank Pawl (C) so that its Lower Extension (H) will hook over Stud (J) of the Credit Balance Bell Crank (8).

As a complete carryover occurs in the Add Wheels and the Credit Balance and Motor Control Slide (9) moves forward into carry position, the Credit Balance Bell Crank Pawl (C) will rotate the Credit Balance Operating Bell Crank (8) clockwise.

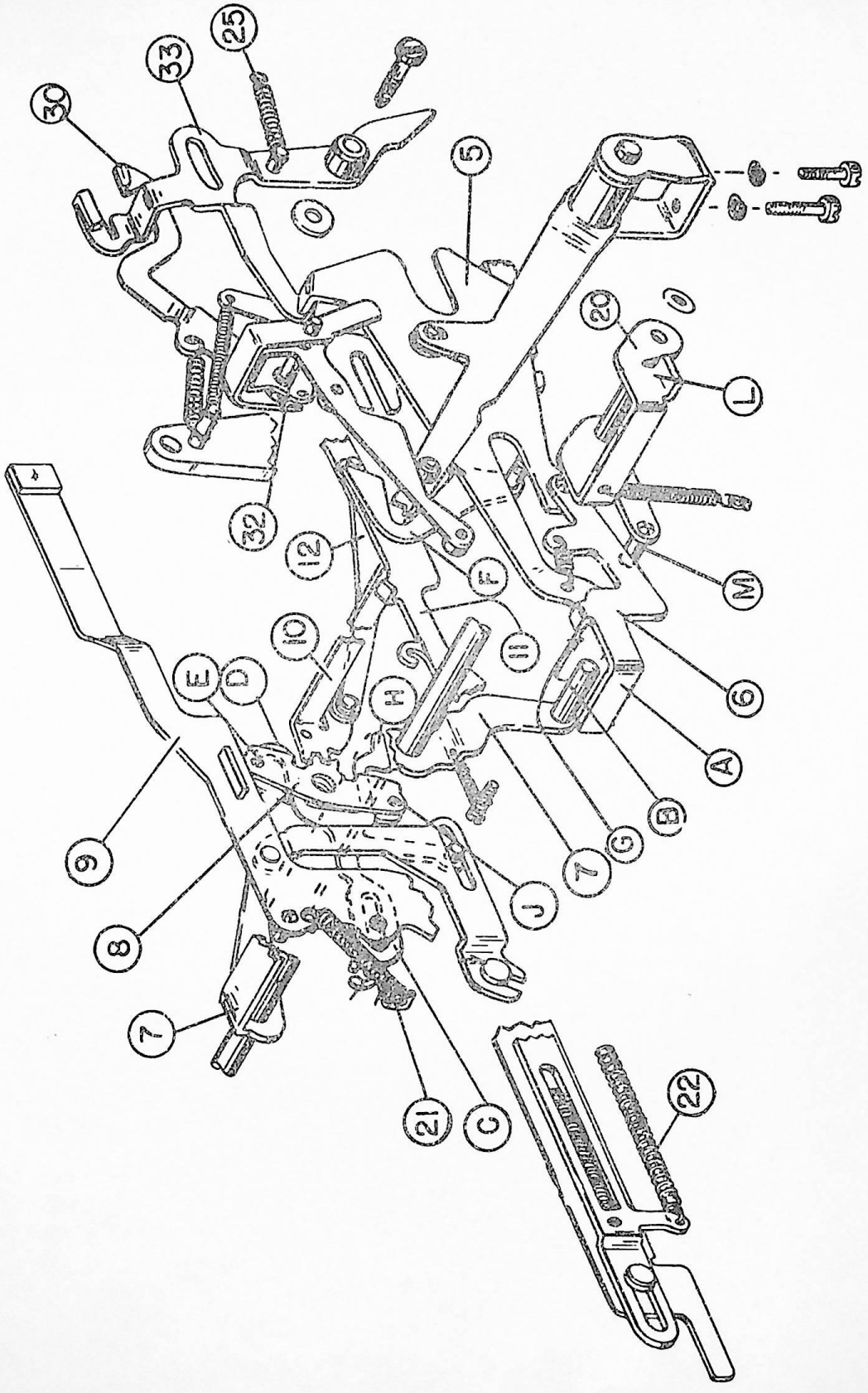



PLATE 19 CREDIT BALANCE MECHANISM

## CREDIT BALANCE OPERATION

### Negative to Positive Operation

This in turn will rotate the Credit Balance Carry Pawl Cam Assembly (10) to the front of machine and Extension (F) will cam down the first Carry Pawl (11) accumulating the "Automatic One". As Cam Assembly (10) rotates it will move Negative Total Block Arm Link (12) to the rear. This will lower the Negative Total Block Arm (Inner) (13) Plate 18 into the path of the Stud (36) on the Negative Total Link Operating Arm Pawl Assembly.

When the Stop Section restores, the Blank Stroke Lock Bell Crank (1) will push Links (2) and (3) to the rear lowering the Negative Total Block Arm (Outer) (4) out of the path of the stud on the Negative Total Link Operating Arm Pawl Assembly.

### Negative Blank Stroke and Negative Total Operation

To permit a Negative Blank Stroke Operation, the Negative Total Block Arm (outer) (4) Plate (18) will be in a lowered position and the Negative Total Block Arm (Inner) (13) will be in a raised position. This will allow the stud on the Negative Total Link Operating Arm Pawl Assembly to pass between the two Block Arms (4) and (13). The Negative Total Link Operating Arm Pawl drives the Negative Total Link (14) to the rear which in turn will rotate the Subtract Slide Shift Plate Lift Arm (15) causing the Subtract Yield Arm (16) to raise the Subtract Slide Shift Plate (17) to Subtract position. This will cause the Accumulator Wheels to revolve to Subtract position.

On a Negative Total operation the same thing occurs and keeps the wheels in Subtract position permitting a Negative Total to be taken from the Subtract Wheels.

### Credit Balance Disconnect

When the Division Key is depressed and the Division Shaft (18) Plate (18) rotates the Right Division Shaft Arm (19) counter clockwise, Stud (K) on the outer link of the Right Division Shaft Arm (19) will contact Lip (L) of the Division Subtract Slide Pawl Raising Bell Crank (20) causing it to move up. Stud (M) of Bell Crank (20) will contact the Subtract Slide Pawl (6) of the Subtract Slide (5) raising Extension (A) out of the path of Stud (B) of the Credit Balance Bell Crank Pawl Lift Arm (7). Therefore, during Division operations the Credit Balance Mechanism will be inoperative.

The purpose of Yield Spring (21) Plate 19 on the Credit Balance Bell Crank Pawl (C) is to permit the Credit Balance and Motor Control Slide (9) to move to the rear under the M & Q Rack during an error operation in Division. Spring (22) of the Credit Balance and Motor Control Slide (9) will cause Spring 21 to yield when the Credit Balance Bell Crank Pawl (C) limits against the Credit Balance Operating Bell Crank (8). Slide (9) will move on to the rear under the M & Q Rack camming its own Carry Pawl down and restoring the Division Key. The machine will then proceed to clear out in the usual manner and stop.

# MODELS 94 & 98

# INSPECTIONS

# &

# ADJUSTMENTS

Printed In U.S.A.



Issued, 1957

MODELS 94 & 98 INSTRUCTIONS
INSPECTIONS AND ADJUSTMENTS
DIVISION
Plate 1 & 2

Before attempting to adjust the Division mechanism make certain that all the adjustments pertaining to the 93 part of the machine are correct. Make sure that all parts are free and in their proper position. All Springs must be hooked, eyes closed and of the correct tension.

1. Machine normal, Lip (C) Plate (1) on Division Drive Arm (3) should have safe hold on front portion (2A) of Division Control Arm (2). Next, depress Division Lever (1) and relatch Division Drive Arm (3) on rear portion (Z) of Division Control Arm (2). Lip (C) on Division Drive Arm (3) should have safe hold on rear portion (Z).

   Adj. Form inner extension of Division Control Arm (2) that contacts Extension (X) of Division Lever (1) to equalize hold of Lip (C) on front Portion (2A) and rear portion (Z) of Division Control Arm (2).

2A. Division Lever (1) depressed and with the Division Drive Arm (3) resting on the hub of Division Control Arm (2) adjust Right Division Shaft Arm (10) Plate 2 so it clears under side of Division Shaft Latch (11) by .020.

   Adj. Loosen screw (21) in Right Division Shaft Arm (10) and move Arm to a different position on Division Shaft (23) Plate 1.

B. Lift Division Drive Arm (3) Plate 1 on top of Division Control Arm (2). Move the Automatic Remainder Link Latch (13) Plate 2 away from outside Link (L) on Division Shaft Arm (10) and release it. There should be enough clearance to allow Latch (13) to move back under latching point on Link (L).

   Adj. Form rear portion (H) of Right Division Shaft Arm (10) so it will lift Outer Link (L) higher.

C. Machine normal, with outside Link (L) on Right Division Shaft Arm (10) resting on Automatic Remainder Link Latch (13) the Motor Drive Control Arm should clear Clutch Pawl by .025.

   Adj. Form the Upper Marcel Link.

3. Machine normal, depress Division Lever (1) Plate 1 and release Division Drive Arm (3) slowly. Total Lock Link (20) Plate 2 must release before Motor Contacts are released.

   Adj. Form Subtract Operating Arm Bail (12) so it's extension (P) is closer to Lip (Q) on Total Key Lock Link Stop Trip Arm (22). OR FORM FRONT EXTENSION OF BAIL 12

4. Machine normal, depress Division Lever (1) Plate (1) and inspect to see that Division Drive Arm (3) moves down and limits on the hub of Division Control Arm (2).

   Adj. If Drive Arm (3) doesn't limit on hub of Division Control Arm (2) it may be due to the following:

(a) Inner Link (K) Plate 2 on right Division Shaft Arm (10) should hold Plunger Bail Assembly (12) Plate (3) to within .010 of a limit. Form lower extension of Link (K) for adjustment.

(b) Bind in Division Shaft (23), Plate (1).

(c) Subtract Yield Arm (24), Plate (2) Binding.

(d) Springs of incorrect tension which would overcome the tension of Division Drive Arm Spring (25), Plate (1).

(e) Bind in Motor Drive Control Arm, Upper Marcel Link or Contact Points.

(f) Subtract Slide Pivot Pawl (20), Plate (19) uplimiting.

5. Machine normal, Backspacer (14) Plate 1 must limit on Stud (R) in the left Side Frame.

Adj. Loosen set screw in the Back Space Arm, place Backspacer (14) against stud (R) in the Left Side Frame and adjust Backspace Shaft Arm so it clears dwell in the Plunger Bail (12), Plate (3) on all sides. Arm should be adjusted sidewise to have a full hold on the Plunger Bail (12).

6. Item in Stop Section, turn Main Shaft forward, release Backspacer (14), Plate (1) manually and restore Main Shaft until the high point on Back Space Cam (M) is on roll (0) of Backspacer (14). Set the Back Space Drive Arm so Back Space Drive Pawl clears roll on the Correction and Back Space Slide Plate by .010. Check alignment of Backspace Drive Pawl with Backspace Rack.

Adj. Loosen the screw in Back Space Drive Arm and move Arm to a different position on Back Space Shaft.

7. Machine normal, the Long Pawl (8), Plate (1) should have .060 hold on Backspacer (14) and upper end of Pawl (8) should limit on stud in Non-Print Link (5).

Adj. With Non-Print Link (5) limiting on stud (S) at rear of left Side Frame, form the upper end of Long Pawl (8).

8A. Machine normal, depress Division Lever (1), Plate (1) lift Division Drive Arm (3) on top of Division Control Arm (2). Inspect for the following conditions:

(1) Latch Back Space (14) under Outer Pawl (7). Backspacer (14) must have a full hold.

(2) Long Pawl (8) should overhang the Long Pawl Latch (9) by .030 or more.

(3) Non-Print Block Arm (5A) must have a safe hold on the Hammer Restoring Bail.

(4) Two Speed Control Link (6) to clear Two Speed Control Bail.

Adj. Recheck Inspection 2A. Change the size of roll (F) on the Non-Print Link Bell Crank only if all 4 adjustments are incorrect. If any one of the conditions is still incorrect adjust:

(1) Stud in the lower rear portion of Non-Print Linkage (5).

(2) Check Inspection 7.

(2A) Long Pawl (8) latched, lip on latch (9) should hold Long Pawl (8) clear of Backspacer (14) about .040. Form lip on Long Pawl Latch (9).

(3) Form Non-Print Block Arm (5A).

(4) Form Two Speed Control Link (6).

B. With Division Drive Arm (3) resting on the hub of Division Control Arm (2) inspect for additional movement of Non-Print Linkage (5) toward front of machine.

Adj. If no movement exists roll (F) on Non-Print Link Bell Crank may be too large. Use a smaller roll or form Extension (Y) of Arm (4).

9A. Machine normal, manually latch right Division Shaft Arm (10) Plate 2. Motor Control Arm (17) should clear front extension of Motor Control Slide (16) by .030.

Adj. Form Motor Control Arm Link (26).

B. Machine normal, trip Carry Pawl (15) for Motor Control Slide (16). With screwdriver move Motor Control Slide (16) rearward and release slowly. Motor Control Arm (17) should move Division Latch (11) clear of right Division Shaft Arm (10) about .060.

Adj. Form left end of Motor Control Arm (17) for more or less hold on front extension of Motor Control Slide (16).

Machine normal, Motor Control Arm (17) should have slight tension on left end to prevent Motor Control Slide (16) going under it.

Adj. Form Motor Control Arm (17) near base pivot.

10. Main Shaft forward, Subtract Operating Arm (27) Plate (2) should clear bottom of Subtract Block Cam by .015.

Adj. Form Subtract Operating Arm (27).

11. Depress Division Lever (1) Plate (1). With Division Shaft Drive Arm (3) resting on the hub of Division Control Arm (2) the Subtract Yield Arm (24) Plate (2) should touch stud in Center Frame. to large - act as taken limit low - would go to subtract

Adj. Inspect to see that Subtract Yield Arm (24) is free. Change roll (J) on Subtract Arm Operating Bail (12). Recheck Inspection 3.

12A. Machine normal, space in units column, depress Division Lever (1) and turn Mainshaft all the way forward. Division Bail (18) Plate (1) should clear lip on Arm "A" by .010.

Adj. Form Division Bail (18).

Machine still in same position, roll (T) on left end of Division Bail (18) should clear Division Lever (1) about .010.

Adj. Change Roll (T).

B. Machine normal, ~~cipher~~ 0 in units column, depress Division Lever (1) and turn Mainshaft all the way forward. Division Bail (18) should normalize Division Lever (1) and Arm "A" should be in front of "B" about .050.

Adj. Division Bail (18) should be free. Recheck Inspection 12A. Division Bail (18) should not hit Carry Pawls.

Machine still in same position right extension on Division Bail (18) should clear Repeat Key Extension by .010 with Repeat Key unlatched.

Adj. Form right extension on Division Bail (18).

Machine still in same position, Repeat Key latched, Division Bail (18) should not rock sufficiently to touch Division Lever (1) or lip of Arm "A".

MODELS 94 & 98 INSTRUCTIONS

MULTIPLICATION

Plate 3

Before attempting to adjust the Multiplication mechanism, make certain that all adjustments pertaining to the 93 part of machine are correct. Make sure that all parts are free and in their proper position. All springs must be hooked, eyes closed and of correct tension.

1. Multiply Lever (1) Plate (3) operated, Mainshaft all the way forward ~~on second or Automatic Cycle~~ extension "E" Plate (1) on front of Division Shaft Drive Arm (3) must clear top of Motor Control Arm Drive Pawl (8) Plate (3) by .030.

   Adj. Form Extension "E" Plate (1) of Division Shaft Drive Arm (3).

2. ~~Multiply Lever (1) latched to rear~~, rotate mainshaft ~~3/4 cycle~~, Motor Drive Control Arm Drive Pawl (8) must clear back side of lip on extension "E" Plate (1) by .020.

   Adj. Form lower end of Motor Drive Control Arm Drive Pawl (8) Plate (3) where it limits on hub.

3. With Cipher in first column, Mult Lever (1) to rear, rotate mainshaft ~~until Division Bail (18) Plate 1 has reached maximum height~~, at this time, Link No. 3 Plate (3) must be lifted high enough to clear Link No. 2 by .020 - .025.

   Adj. Check Division Bail (18) for restricted movement. Also recheck adjustment of Division Bail (18).

4. Machine normal, latching point on Link No. 2 Plate (3) should overlatch rear of Lip on Link No. 3 by .020.

   Adj. Form lip "D" of Motor Drive Control Shaft Arm "L" to front or rear.

5. Lip "D" on Motor Drive Control Shaft Arm (L) held down by Link No. 2, Motor Drive Control Arm to clear Ratchet Pawl on Motor Drive Crank, ~~no more than~~ .025 - ~~.030~~.

   Adj. Form the Lip on right arm of Motor Drive Control Shaft, where it contacts stud on Motor Trip Bell Crank.

6. Cipher in units column, Mult Lever (1) Plate (3) latched to front, turn Mainshaft all the way forward by hand. Stud "G" Plate (1) on Back Space Cam (M) to push Dial Rack Raising Arm Slide (4) Plate 3 to rear far enough for lip "D" on Motor Drive Control Arm (L) to clear bottom portion of Link No. 2 by about .020.

   Adj. Form top front of extension (M) or Change Roll on Multiply Lever lower extension. Mainshaft all the way forward, there should be additional movement in Dial Rack Raising Arm Slide (4).

7. With contact points held open by high point on Motor Drive Crank, arm on left end of Feature Key Shaft should clear Dial Rack Raising Arm Slide (4) by .030. Move Multiply Lever (1) to front and rear of machine to test.

   Adj. Form Lower Marcel Link.

8. Mult Lever (1) held to rear, roll (H) resting on point "4B". Should be able to raise roll (H) off point "4B" not less than .001 nor more than .003. Plunger Bail (12) should be held to within .010 of uplimit.

   Adj. Adjust Arm (6) on Dial Rack Raising Shaft (5).

Too much. Not ring plunger
stick slide & motor will keep
running.

MODELS 94 & 98 INSTRUCTIONS

SHORT CUT MECHANISM

Plates 4 & 5

1. As the Short Cut Key (1) is depressed there should be about .015 horizontal clearance between ear (G) on Short Cut Key (1) Plate (4) and Short Cut Key Block Arm (20) Plate (5).

   Adj. If Backspacer is free and properly set, form right fingers (H) on Short Cut Block Arm (20).

2. With Short Cut Key (1) latched, stud (C) Plate 3 on Multiply Lever (1) must not contact Multiply Non-Add Drive Pawl (9).

   Adj. Form Short Cut Key ear (G) Plate (4) to latch Short Cut Key (1) later.

03. Item in Stop Section, depress Short Cut Key (1) slowly, escapement lead and latching of Short Cut Key (1) must occur at same time.

   Adj. Form the Short Cut Space Operating Arm ear (J).

04. On a Short Cut Key depression, the Short Cut Space Drive Pawl (4) must cam off stud (K) in Short Cut Space Yield Arm (5) immediately after escapement lead takes place.

   Adj. Form left end of Short Cut Space Drive Pawl (4) or change roll (L) on Short Cut Key (1).

5A. With Short Cut Key (1) latched, as roll on Stud (G) Plate (1) on Backspace Cam raises Negative Multiply Operating Arm (18) Plate 5 there should be about .060 clearance between Negative Multiply Operating Arm (18) and Negative Multiply Operating Arm Latch (10).

   Adj. Form ear (M) on Negative Multiply Operating Arm Latch (10) where it limits on keyboard.

B. On return stroke of the Mainshaft, Negative Multiply Operating Arm (18) must not relatch.

   Adj. Form front portion of Negative Multiply Operating Arm (18).

6. At end of first return stroke Negative Multiply Operating Arm (18) should raise Printing Hammer Catch Shaft (23) to a limit against Hammer Guide Comb screw head (left Side).

   Adj. Left arm (22) on Printing Hammer Catch Shaft (23) should clear Extension (F) of Operating Arm (18) by ~~1/16~~ .030" with machine normal and Negative Multiply Operating Arm (18) held by Negative Multiply Operating Arm Release (33).

6B. ~~Subtract Operating Arm Bail (12) Plate (2) should not be false limiting.~~ Position right, inner arm (27) Plate 5 on Printing Hammer Catch Shaft, for Subtract Yield Arm to just touch Center Frame stud when Shaft is held in rocked position. Right Arm (27) to be .020 overlatched with Latch Arm (28). Adjust by changing position of Arm (27).

7. On second stroke of Mainshaft, Negative Multiply Operating Arm (18) must relatch.

   Adj. Check Latch (10) for binds and proper spring tension. Also, check Mainshaft for short stroking.

8. Short Cut Key (1) Plate (4) latched, Backspace Control Pawl Operating Arm (13) should hold ~~Long Pawl (15) Long Pawl Latch (16) and~~ Outer Pawl (14) clear of the Backspacer about .040 so machine will backspace on first return stroke.

   Adj. Form Backspace Control Pawl Operating Arm Link (12).

9. With D Key Latched, Backspace Control Pawl Operating Arm (13) should hold the Long Pawl (15) Long Pawl Latch (16) and ~~Outer Pawl (14)~~ clear of the Backspacer by about .040.

   Adj. Form Decimal Print Bell Crank (34).

10. With one digit in Stop Section and Subtract Key latched Printing Hammer Catch Shaft Release Arm Pawl (N) Plate 5 must clear stud on Printing Hammer Catch Shaft Latch (28).

    Adj. Form Printing Hammer Catch Shaft Release Arm (29) at offset.

11. On high point of Backspace as Mainshaft restores Printing Hammer Catch Shaft Release Arm (29) must unlatch Printing Hammer Catch Shaft (23) when Printing Hammer Catch Shaft (23) is latched.

    Adj. Form Printing Hammer Catch Shaft Release Arm (29) forward or rearward.

12. Printing Hammer Catch Shaft (23) must unlatch by Correction Key operation.

    Adj. Check Reset Gears for loose, Reset Gear Shaft Extension (32) for loose or change roll (31) on Reset Gear Shaft Extension (32).

13. Constant Lever (35) latched forward, Subtract Key should latch and stud on Printing Hammer Catch Shaft Latch (28) should be in position to be unlatched by the Printing Hammer Catch Shaft Release Arm (29).

    Adj. Form arm (0) on Constant Lever (35) forward or rearward.

MODELS 94 & 98 INSTRUCTIONS

M & Q FEED MECHANISM

Plate 6

1. Machine normal, depress Constant (memory) Key and Motor Bar. Turn mainshaft all the way forward, manually raise M & Q Rack and check M & Q Type for aligning with the other Type.

   Adj. Form Extension (D) on Type Carrier Retaining Pawl (8) up or down. Extension (D) should also limit in notch of M & Q Rack.

2. Machine still in same position, Lock Hook (7) should be at least .060 above extension (E) of Type Carrier Retaining Pawl (8) and Long Pawl Latch (9) Plate (1) clearing Long Pawl (8) Plate (1) at least .030.

   Adj. Check for false limit (SHORT STROKE) in Mainshaft.

3. (?) Machine normal Unlatch Type Carrier Retaining Pawl (8), manually raise M & Q Rack (1) until extension (D) of Type Carrier Retaining Pawl (8) is on high part of tooth. Front of extension (E) on Type Carrier Retaining Pawl (8) should be flush, or slightly to rear of latching surface on Lock Hook (7).

   Adj. Form extension (E) of Type Carrier Retaining Pawl (8). (FORWARD OR REWARD)

4. Mainshaft fully forward on a print stroke, Release Hook (10) should overlatch lip (C) on Type Carrier Retaining Pawl (8) by .030.

   Adj. Check Hammer Restoring Arms and Release Hook (10) for free.

   Restore Mainshaft slowly and check extension (E) of Type Carrier Retaining Pawl (8) for overlatching with Lock Hook (7) by .030 - .040.

   Adj. Pein or grind Release Hook (10) at point of contact with hub on Hammer Restoring Arm.

5. Machine normal, turn Main Shaft through until the top Subtract Screw Stud lines up with the Bottom Subtract Screw Stud vertically. The screw in the Type Carrier Operating Cam (2) should line up horizontally with top Subtract Screw Stud.

   Adj. Change the position of Type Carrier Operating Cam on the Main Shaft.

6. Mainshaft all the way forward M & Q Feed Pawl (6) should downlimit on Hammer Trip Shaft. (May have a bind - Pawl not getting out from under the roll.)

   Adj. Check M & Q Feed Pawl Assembly (6) for binds. Also, recheck Inspection 5.

   B. As Mainshaft restores M & Q Feed Pawl (6) should raise tooth on M & Q Rack (1) .010 above extension (D) on Type Carrier Retaining Pawl (8).

   Adj. Change kick off roll on center frame stud (A) only if all parts that operate M & Q Feed Pawl Assembly (6) have been checked for free, loose or worn. Recheck Inspection 5. (Worn)

7. Mainshaft restoring on printing stroke, M & Q Printing Hammer must be clear of M & Q Type Rack.

(recheck #5)

PLUNGER BAIL LATCH



~~Adj. Recheck Inspection No. 5.~~

8. Machine normal, Motor Drive Arm to hold Plunger Bail Latch extension (X) Plate (3) clear of Plunger Bail (12) about .020.

   Adj. Form Plunger Bail Latch (13).

9. Machine normal, 7 digit item in Stop Section turn Mainshaft forward and raise Plunger (7) for it to be held in position by Plunger Bail Latch (13). As Mainshaft restores Reset Link should clear roll on Reset Gear.

   Adj. Form offset to lengthen or shorten extension of Plunger Bail Latch (13).

THE PURPOSE OF THE PLUNGER BAIL LATCH IS TO DELAY THE RESET OF PLUNGER BAIL ON CARRY OVER STROKE OF MAIN SHAFT.

CAM SET TOO FAR FORWARD

1. M & Q RACK MAY NOT FEED HIGH ENOUGH.
2. CAM MAY LIMIT ON HAMMER LATCH SHAFT CAUSING SHORT STROKE IN MAINSHAFT.

CAM SET TOO FAR TO THE REAR

1. MAY FAIL TO FEED M & Q RACK
2. MAY FEED TOO SOON BEFORE HAMMER CLEARS TYPE.

## INTERLOCKS

Plate 7

1. Multiply Lever to the front or rear and Mainshaft forward, Dial Rack Raising Arm Slide Lock Arm (2) to move down and limit on Dial Rack Raising Arm Slide (3) behind Step (B) or in front of Step (C).

   Adj. Check Slide (2) to be perfectly free and its spring for proper tension.

2. Machine in same position as for Inspection 1, Short Cut Key Block Arm (4) to have full blocking hold on Backspace Control Pawl Lever (6).

   Adj. Check all parts concerned for free and springs for proper tension.

3. Multiply Lever latched to front or rear, Extension (H) of Short Cut Key Block Arm (7) to have safe blocking hold on Extension (J) of Short Cut Key.

   Adj. Check all parts concerned for free. It may be necessary to form Block Arm (7) for sidewise alignment.

4. Short Cut Key Stem Lock Extension (K) should clear Extension (L) by not more than .030 when the Subtract Key is depressed.

   Adj. Raise or lower Guide Stud (R) by forming bracket where Stud (R) is mounted.

5. As the Short Cut Key is depressed, Extension (L) should clear Extension (K) by no more than .030.

   Adj. Form the same bracket as in Inspection 4.

MODELS 94 & 98 INSTRUCTIONS

CONSTANT LEVER, SPACE KEY AND MEMORY KEY

Plate 8

1. With 10 spaces or 10-8's in Stop Section, Constant Lever (1) latched to front of machine, restore Stop Section, push Back Space Key (7) to right. Spring (11) on Constant Lever (1) must have enough tension to restore all Stops.

2. Back Space Slide (7) to extreme right. Restoring Plate Lever Latch Trip Arm (9) should not limit but have at least .003 further movement.

   Adj. Change roll (8) or form right end of Back Space Slide (7). If Back Space Slide (7) is formed down make sure it does not bind on Blank Stroke Lock Bell Crank (19).

3. Stop Restoring Plate (3) should clear stops by .005 - .010.

   Adj. Change washers under Stop Restoring Plate Plunger Screw (20) to raise or lower Stop Restoring Plate (3).

5, 4. Space and Memory Keys to have .010 further downward movement after they are latched by Key Stem Lock Plates (14).

   Adj. Form Key Stem Lock Plates (14). If no downward movement exists Key Stem Lock Plates (14) will not move over Keys and latch them down.

4, 5. Memory Key must limit on lower Keyboard Plate and Universal Bar (13) should have .005 additional downward movement. This prevents Memory Key from cocking in Keyboard and sticking.

   Adj. Form Memory Key Extension where it rides over Universal Bar (13).

6. Blank Stroke Lock Arm not to bind Lock Plate Link Bell Crank (15). If Memory and Space Keys were not released the machine would yield through.

7. Nine items in machine, depress Space and Memory Keys. Stop Section to release Space and Memory Keys.

   Adj. Check Lock Plate Link Bell Crank (15) and Key Stem Lock Plates (14) for free.

8. Universal Bar Limit Plate (12) must rest on lower Keyboard Plate.

   Adj. Form Universal Bar Limit Plate (12). This prevents spongy Numeral Key Action.

MODELS 94 & 98 INSTRUCTIONS

BLANK STROKE LOCK BELL CRANK AND RELEASE KEY

Plate 9

1. Stop Section restored, Blank Stroke Lock Bell Crank (5) to have .005 - .010 movement to front of machine.

   Adj. Form Upper Extension (C) of Blank Stroke Lock Bell Crank (5).

2. Stop Section restored. Blank Stroke Lock Bell Crank (5) to pull Latch "B" .050 below Arm "A".

   Adj. ~~Form Blank Stroke Lock Bell Crank (5).~~ RECHECK INSPECTION #1.

3. Release Key (1) pulled to front, Arm "A" to clear Latch "B" by .030. .050 or more

   Adj. Form Key Lever Extension (2).

4. Item in Stop Section, pull Release Key (1) so Arm "A" is latched by Latch "B". At this time, Inner Pawl (4) should have about a .060 hold on Back Spacer.

   Adj. Form lower Extension of Link (3) or lower portion of Non-Print Linkage.

5. Spring (11) to restore Link (3) so that when Link No. 2 Plate 3 is latched to rear of machine by Link No. 3 Plate 3 there will be .010 clearance between top fork (S) on Link No. 3 and stud (R) in Arm "A".

   Adj. Check parts for free and spring (11) for sufficient tension.

6. Release Key (1) held all the way forward, Feature Key Latch (9) should clear the latching point of the Dial Rack Raising Arm Slide (10) by .030.

   Adj. Form Release Arm Link (8).

MODELS 94 & 98 INSTRUCTIONS

SUBTRACT KEY CONTROL MECHANISM

Plate 10

1. As the Subtract Control Slide (1) is moved to the right, Stud (B) of Arm (5) should move into narrow portion of Dwell (A) without binding.

   Adj. Check all parts concerned for free. ~~It may be necessary to change Roll (6).~~

MODELS 94 & 98 INSTRUCTIONS

DECIMAL KEY

Plate 11

1. Machine normal Depress Decimal Key (1) slowly. Total Lock Link to be released before Decimal Operating Bail Link (3) latches on Feature Key Latch.

   Adj. Form ear (H) on Decimal Operating Bail (2) to release Total Lock Link at right time. NOTE: If Total Lock Link did not release, a total sign will print when printing a decimal point.

2. Decimal Operating Bail Link (3) just latched on Feature Key Latch, Motor Control Arm should have a full hold on Motor Clutch Pawl.

3. Decimal Key (1) held down, Motor Control Arm should clear Motor Drive Clutch Pawl by .025.

   Adj. For No. 2 and 3 re-check the adjustment of the Upper Marcel Link.

4. Machine clear, Depress Memory Key; turn mainshaft all the way forward, Decimal Print Hammer Block Arm Extension (E) must have a full hold on Multiply Print Hammer Extension (F).

   Adj. Form Decimal Print Hammer Block Arm Extension (E).

5. Decimal Operating Bail Link (3) latched on Feature Key Latch Decimal Print Hammer Block Arm (7) to move to rear and limit against M & Q Feed Pawl Pivot stud.

   Adj. This adjustment should be correct if corresponding adjustments are correct.

6. With M & Q Rack raised to zero (0) position, Decimal Print Hammer Block Arm Extension (E) to move to front and clear Decimal Hammer Extension (F) by .030.

   Adj. Form ear (G) which limits on Back Space Shaft.

MODELS 94 & 98 INSTRUCTIONS

MULTIPLY LEVER FULL STROKE PAWL

Plate 12

1. Push the Multiply Lever (1) to the rear slowly and see that Extension (C) of Latch (3) does not move into Step (D) of Full Stroke Pawl (2) until the rear portion of Multiply Lever (1) is .010 to .015 beyond Step (F) of Pawl (2).

   Adj. Check Full Stroke Pawl (2) and Latch (3) for loose or worn. AND FOR FREE.

2. Multiply Lever (1) all the way to the rear, return the Lever slowly and see that Non-Add Drive Pawl (4) relatches with Stud (A) before Extension (C) moves into Step (E). RELEASE N.A. PAWL #4

   Adj. Loosen Rear Screw of Multiply Lever Full Stroke Pawl Guide Plate and move Guide Plate to the right or left.

MODELS 94 & 98 INSTRUCTIONS

TOTAL SLIDE LOCK ARM

Plate 13

1. Machine normal, Total Slide Lock Arm (1) to have .010 ~~clearance between Extension (C) and base of machine.~~ downward movement

   Adj. Form Extension (A) if Hammer Trip Shaft is adjusted correctly.

1. Item in Stop Section, release Latch (3) and check Bail (4) to downlimit squarely on Hammer Guide Comb.

   Adj. Form Bail (4).

2. Relatch Bail (4) on Latch (3), Stop Section indexed fully to the left, all Hammers fired, Hammers should clear under Bail (4) by .010.

   Adj. Form right end of Bail (4).

3. Stop Section normal, release Latch (3) and pull manual Backspace Key all the way to the right, Lip (A) of Bail (4) should just relatch with Latch (3).

   Adj. Change Roll (C). Remove excess end play in Reset Gears.

4. Backspacer on high point of Backspace Cam, Latch (3) to clear underside of Extension (A) by .010.

   Adj. Form Link (12). OR TIP STUD ON CATCH #3.

5. Machine normal, Printing Hammer Catch Shaft fully restored, Latch (16) to clear below Extension (A) by .030.

   Adj. Form lip of Latch (16).

MODELS 94 & 98 INSTRUCTIONS

POSITIVE RACK RESTORING MECHANISM

Plate 15

1. Machine normal, depress a row of Cipher Stops and turn Mainshaft all the way forward. Check for .008 to .010 Lug clearance. Also check for .020 Cam clearance.

2. Machine normal, using a spring hook or thin screwdriver, press Roll (2) on Rack Restoring Actuator Assembly forward to check for free movement of Rack Restoring Mechanism.

3. A. Machine normal, place all Accumulator Racks in carry position. With a full row of Space Stops depressed, turn Mainshaft completely forward watching the Carry Pawls to make sure they restore back to normal position. At this time check for .007 Lug clearance.

   Adj. Form Extension (A) to limit sooner or later against Stud (B) in side frame.

   B. Machine normal, all Accumulator Racks in carry position, check Rack Restoring Plate (6) for slight amount of rearward movement before contacting Accumulator Racks.

   Adj. Check all parts for free.

4. Machine normal, insert a full row of 505050's and turn Mainshaft completely forward. Teeth of Accumulator Racks should be evenly aligned. Also check printing alignment. If alignment is off it indicates positive Rack Restoring Mechanism is driving too far.

   Adj. Recheck inspection 3A.

3. HOLD NUMERAL KEY AND YIELD MAINSPRING. WATCH ACCUMULATOR RACK FOR .007 REARWARD MOVEMENT

ADJ. FORM EXTENSION "A" ON LINK 4

MODELS 94 & 98 INSTRUCTIONS

NON-ADD AND SUB-TOTAL MECHANISM

Plate 16

1. The initial position of the Character Selector Shaft is made by loosening the Character Stop and placing the stud in the left arm of Selector Shaft down on the Total Slide and the Character Stop resting on the lug of the Character Rack and tightening screw. Make sure Selector Shaft has a slight amount of end play.

2. Non-Add Key latched, stud in Non-Add Cam Lock Lever Assembly should be positioned behind flange of Total Cam and Non-Add Symbol should print on Non-Add operation.

   Adj: Form Extension (A) for more throw.

3. Sub-Total Key latched, Non-Add and Sub-Total Link (2) should position extension (B) in path of Roll (C) and on Sub-Total operation, Sub-Total Symbol to print.

   Adj: Form Total Slide to move Stud (C) to the rear for more drive.

4. Machine normal, Pawl (F) should rest on top of Lip (G). As the Total Slide moves to the rear, Pawl (F) to drop behind Lip (G) and unlatch Sub-Total Key on return stroke.

   Adj: Check Pawl (F) for free and proper spring tension.

CREDIT BALANCE

Plates 18 and 19

1. Machine normal, Blank Stroke Lock Bell Crank (1) to have .005 movement.

   Adj. Form Bell Crank (1).

2. Machine normal, item in Stop Section pull Release Key, Outer Block Arm (4) not to drop below Stud (36) in Negative Total Link Operating Arm Pawl. Arm (A) in front of Latch (B), Outer Block Arm (4) to move up and limit on Stud (36).

   Adj. Form Link (3).

3. Machine normal, the Subtract Yield Arm (16) to have no further downward movement.

   Adj. Form Arm (16).

1. Subtract Key depressed and Mainshaft forward, the Subtract Yield Arm (16) should clear the bottom of Stud in right center frame not more than .005.

   Adj. Form Outer Extension of Subtract Operating Arm.

5. Negative Total in machine, Mainshaft all the way forward, the Subtract Yield Arm (16) should clear the bottom of Stud in right center frame not more than .005.

   Adj. Form Subtract Slide Shift Plate Lift Arm (15).

6. Machine normal, positive position and item in Stop Section, Stud (36) in the Negative Total Link Operating Arm Pawl to clear the longest Block Arm (4) or (13) by .010.

   Adj. Change position of Total Lock Cam Adjusting Plate on the Total Lock Cam.

7. When shifting from positive to negative on a blank stroke operation, the Subtract Slide Shift Plate (17) should be positioned soon enough for at least .035 clearance between its lip and the Subtract Stud before the Stud contacts the lip.

   Adj. Recheck Inspections 5 and 6.

8. Negative Total Link (14) to be free and rest against the Division Shaft.

9. The Negative Total Link Operating Arm Pawl must clear extension on the Negative Total Link by .015 on a positive total operation.

   Adj. Check Inspection 6. Form Link (14) at offset.

10. Machine normal, Lift Arm Stud (B) should have .010 movement between center frame limit and extension (G) of the Subtract Slide. This should position hook (H) for a good hold on Stud (J).

    Adj. Form Lip (G)

11. Subtract Key depressed, Mainshaft all the way forward. Lift Arm Stud (B) to have .010 movement between center frame limit and Extension (A). This should position Hook (D) for a good hold on Stud (E).

    Adj. Form Lip (A).

12. Credit Balance Carry Pawl Cam Assembly (10) to be meshed with Credit Balance Bell Crank (8) as shown on Plate (19).

13. Carry Pawl Cam Assembly (10) should have .005 to .008 end play.

    Adj. Use spacers between frame and head of Cam Assembly (10) pivot screw.

14. Machine in positive position, Cam Assembly (10) Extension (F) should clear stud in Units Carry Pawl (11) by .010 to .015. Machine in negative position, Extension (F) should clear the stud by .010 to .015.

    Adj. Form lower extension of Cam Assembly (10) to limit stud against center frame sooner or later.

CREDIT BALANCE

Plates 18 and 19

15. With Units Carry Pawl latched in carry position, camming surface (F) to clear Stud in Units Carry Pawl by .010 to .015 as it passes over Stud.

    Adj. Form Units Carry Pawl Extension up or down.

16. Carry Pawl Cam Assembly (10) must be free and Whip Spring must have sufficient tension. Spring must be hooked with loop down and to the rear.

17. Machine positive, Inner Block Arm (13) should have a safe blocking hold on Stud (36) in Negative Total Link Operating Arm Pawl. Machine negative, Block Arm must clear the Stud.

    Adj. Form Inner Block Arm (13) ~~or Operating Link (12)~~.

18. Negative Character Printing Arm (33) to be free and clear the Character Type Rack. Spring (25) must have sufficient tension for the printing of a legible "Cr" symbol.

19. The forward extension of the Negative Character Printing Arm (33) should have a full hold on extension of the Subtract Slide when the machine is in add position.

    Adj. Form extension of Printing Arm (33).

20. Mainshaft all the way forward, the Negative Character Printing Arm Latch (30) to be lowered to clear the Printing Arm by .030 to .040.

    Adj. Form the Negative Character Printing Arm Latch (30).

21. Machine normal, the Negative Character Printing Arm (33) to be restored far enough for the Negative Character Printing Arm Latch (30) to latch with .030 to .040 clearance.

    Adj. Form or pein the lower extension of Printing Arm where the Hammer Restoring Arm contacts it.

22. Division Key depressed, Bell Crank (20) and Pawl Assembly (6) should not be uplimiting. Automatic Remainder Link latched on its latch, Extension (A) should clear over Stud (B) by .060.

    Adj. Form Bell Crank (20).

# MODELS 94 & 98

# DIS - MANTLE

# AND

# RE-ASSEMBLE

# PROCEDURE

Printed in U.S.A.



Issued, 1957

Removing Short Cut Mechanism

Remove Short Cut Key and Subtract Interlock Link (36) Plate 4 by removing Keeper; disconnect Spring and Slide from Stud (R) of Multiply Lever Guide Bracket. Remove Keeper from Short Cut Key Block (20) and Latch (17) Plate 5. Remove the Short Cut Key Mechanism by removing the three mounting Screws.

Removing Miscellaneous Parts

Remove Short Cut Key Block Spring (9) Plate 7 from stud in Multiply Lever Guide Bracket. Remove Negative Multiply Operating Arm Spring (21) Plate (5) from stud in Base. Remove Division Drive Arm Spring (25) Plate (1). Remove Negative Multiply Operating Arm Latch (10) Plate (5). Remove Spring from stud in Multiply Lever Guide Bracket. Remove Negative Multiply Operating Arm Latch Release (8) and Latch (10) by removing Keeper from stud in Multiply Lever Guide Bracket.

Unhook Motor Control Arm Drive Pawl Spring (14) Plate (3) from Multiply Lever Guide Bracket. Unhook Non-Add Drive Pawl Spring (15) Plate (3) from Multiply Lever Guide Bracket. Unhook Short Cut Key Spring from Multiply Lever Guide Bracket. Unhook Multiply Lever Full Stroke Pawl Spring (5) Plate 12 from Full Stroke Pawl (2). Remove Multiply Lever Guide Bracket (6) Plate (12) by removing the three Mounting Screws.

Unhook Short Cut Key Spring from Keyboard. Remove Short Cut Key Stem Guide Screw and two Bushings, and Backspace and Correction Slide Limit Plate (22), Plate 18. Remove Short Cut Key Stem Assembly (Re-assemble screw, bushings and Limit Plate (22) thru Short Cut Key Stem Assembly.) Remove Air Check.

Unhook Spring 38 Plate 5 from Backspace Drive Arm (19) unhook Backspace Pawl Spring (39) from Keyboard. Remove Backspace Drive Arm (19) and Pawl (40). Remove Backspace and Correction Buttons. Unhook Backspace Slide Spring (21) Plate 8 from stud in Slide Plate. Remove Backspace Slide (7) Plate 8. Index Stop Section fully to left. Unhook Correction Slide Spring from Correction Slide. Remove Backspace Pawl Uplimit Screw from Correction & Backspace Slide Plate. Remove Correction Slide. Remove Backspace and Correction Slide Plate.

Unhook Constant Latch Release Spring from stud in Side Frame. Remove nut from Constant Latch Release Screw Stud (22) Plate 8. Remove Screw Stud (22) from frame. Remove Constant Latch Release Arm (9). Remove Keeper and Outer Block Arm Connecting Link (6) Plate 9 from left end of Blank Stroke Lock Bell Crank (5) and remove Bell Crank (5). Unhook Motor Bar and Decimal Key Stem Springs from stud in side frame. Remove screw and bushing from Motor Bar and Decimal Key Stem and remove. Remove Keeper at front of Motor Control Link (8) Plate 16 from Non-Add Bell Crank (10) Plate 3. Drive Pin out of Left Motor Control Shaft Arm (K) Plate 3. This Pin drives up. Remove Shaft (11) and re-assemble parts on shaft. Remove Negative Multiply Operating Arm (18) Plate 5. Remove Multiply Block Slide, Keeper and Spacer from stud in Keyboard. Remove Upper and Lower Marcel Links. Unhook Spring (41) Plate 5 from stud in side frame for Printing Hammer Catch Shaft Latch (28). Remove Keeper and Washer from small Arm (0) on Constant Lever (35). Remove Printing Hammer Catch Shaft Latch (28) by removing Trunion nut (42). Remove Reset Shaft Lever (43). Remove Automatic Subtract Key Control Catch (3) Plate (10) by removing Down Limit Screw (7) and Roll (6), and unhook Spring (8) from front end. Remove Keepers.

MODELS 94 & 98 INSTRUCTIONS
DIS-MANTLE AND RE-ASSEMBLE PROCEDURE

Removing Keyboard

Unhook Numeral Keylock Spring from Keyboard. Remove Keeper from rear of Extend Key. Disconnect Repeat Link. Remove Keeper at front end of Total Lock Link (20) Plate (2) and disconnect Blank Stroke Lock Shaft.

Remove Keeper and Spacer for Non-Add Release Link from stud in Left Side Frame. Remove Keeper from front of Negative Total Link (14) Plate (18) and raise link. Unhook Spring for Blank Stroke Lock Arm from Keyboard. Remove Keeper and .005 Washer and remove Lock Plate Link Bell Crank (15) Plate (8) and sleeve, also remove Blank Stroke Lock Arm. Disconnect Total Link and Total Slide from Total Yoke by removing Keepers. Loosen Screw in left Side Frame for Total Yoke Shaft Limit Plate. Remove Total Yoke Pivot Shaft. Unhook Sub-Total Latch Spring from Keyboard.

Disconnect Non-Add and Sub-Total Link Assembly (3) Plate (16) from Sub-Total Bell Crank (2) by removing Keeper. Unhook Spring from Feature Key Release Arm (7) Plate (9) and remove Link (8). Remove Release Lever Extension (2) Plate (9). Remove Keyboard Mounting Screw. Remove Subtract Key Interlock Mounting Plate. Remove right end of Blank Stroke Lock Shaft from right Side Frame. Remove Total Yoke. Remove Keyboard. Remove Non-Add Release Link.

Removing Stop Section

Unhook inner Division Control Arm Spring from stud in left Side Frame. Remove left Stop Section Rail Screw. Remove Division Control Arm (2) Plate (1) and spacer. Unhook Stop Section Spring from Stop Section Reset Crank. Remove Keeper on Stop Section Reset Crank and disconnect Arm. Remove right Stop Section Rail Screw. Remove front Stop Section Rail. Remove Stop Section with rear Rail being careful not to lose leather washers and steel washers.

Removing Misc. Parts from Left Side Frame

Unhook Short Cut Key Block Spring from stud in Side Frame. Remove Short Cut Key Block Pivot Screw (14) Plate (7) and Washer from Base. Remove Keeper and .005 Washer from Stud in Division Bail. Unhook Link "3" Spring from stud in Side Frame and remove Link. Remove roll on stud of Division Bail. Unhook Aux. Negative Operating Arm Latch Spring (44) Plate (5) from stud in Base. Unhook Mult. Lever Lock Slide Spring (15) Plate (7) from stud in Side Frame. Unhook spring at rear of Dial Rack Raising Arm Slide (4) Plate (3). Remove nut and lock washer from Mult. Lock Slide Guide Stud (16) Plate (7), remove stud (16), bushing, spacer and Lock Slide (2). Remove Keepers on each end of Dial Rack Raising Arm Slide (4) Plate (3), washers, roll, bushing and Slide.

Remove Feature Key Latch Spring (12) Plate (9). Unhook Link "2" Plate (3) Spring from stud in side Frame and remove Link "2". Remove Keeper from stud of Feature Keylatch (left) and remove Feature Key Release Link (8) Plate (9). Unhook Backspace Control Pawl Operating Arm Spring (45) Plate (4) from Cotter Key in Base. Remove Keeper from left end of Decimal Bell Crank (34). Remove Screw, lock washer and nut of Backspace Control Pawl Operating Arm (13) from Base and remove Assembly with Link (12) by pulling Link (12) rearward.

Removing Feature Key Release Shaft

Drive Pin in left end of Feature Key Release Shaft toward rear. Remove Left Feature Key Latch (9) Plate (9) and Spacers from Shaft.

Unhook springs (29) Plate (2) from Stud in right Side Frame for Feature Key Latches. Remove Keeper from Decimal Printing Hammer Block Arm (7) Plate (11) and remove Link (6). Pull Feature Key Shaft to right and remove Decimal Print Bail (4).

Removing Division Shaft

Loosen screw (21) Plate (2) in right Division Shaft Arm (10). Unhook Spring on Decimal Operating Bail (2) Plate 11, on Total Key Lock Link Stop Trip Arm (22) Plate (2), on Subtract Arm Operating Bail (12) and on Subtract Yield Arm (24). Push Division Shaft to left and remove right Division Shaft Arm (10), Spacer and Washer from stud on Motor Control Bell Crank. Remove Washer from between Subtract Arm Operating Bail (12) Plate (2) and Decimal Operating Bail (2) Plate (11). Remove Washer located between Total Key Lock Link Stop Trip Arm (22) Plate (2) and Subtract Yield Arm (24). Remove Subtract Arm Operating Bail (12). Remove Decimal Operating Bail (2) Plate (11). Unhook Subtract Operating Arm Spring (30) Plate (2) from stud in frame and remove Arm (27). Remove Total Key Lock Link Stop Trip Arm (22). Remove Subtract Yield Arm (12). Remove Division Shaft. Remove Subtract Slide Shift Plate Lift Arm (15) Plate (18). Remove Division Drive Arm (3) Plate (1).

Removing Printing Hammer Catch Shaft

Unhook Spring from stud in Printing Hammer Catch Shaft. The other end of this Spring is hooked to an Eye in the Right Ribbon Bracket. Remove Spring from Link (7) Plate (14) and Stud in Bail (4). Drive Pins toward front from Printing Hammer Catch Shaft. Loosen Allen Screws of Inner Right Arm and Left Arm of Printing Hammer Catch Shaft and pull Shaft to right. Remove left Arm, Limit Latch, Spacer, Hammer Catch and Inner Right Arm. Remove Non-Print Bail (4).

Removing Two Color Ribbon Mechanism

Remove Keeper at right end of Ribbon Shift Bail. Loosen Set Collar on left end, slip Shaft to left and remove Ribbon Shift Bail. Remove Right Ribbon Bracket. Remove Left Ribbon Bracket.

Removing Right Side Frame

Remove Keeper and Non-Print Bail Latch Link (12) Plate (14). Drive Pin out of Back Space Release Arm (29) Plate 5 toward rear and remove Arm. Drive Pin towards rear of Subtract Block Cam. Unhook Spring on Ribbon Feed Pawl and remove Keepers from right end of Ribbon Reverse Shaft and Hammer Trip Shaft. Remove Keeper from Division Shaft Latch (11) Plate (2) and remove Motor Control Arm Link (26). Unhook Spring on Division Subtract Slide Pawl Raising Bell Crank Assembly (20). Remove Keeper from Stud in right side Frame and Remove Bell Crank (20). Unhook Non-Print Bail Restoring Arm Assembly Spring (13) Plate (14) from stud on inside of Right Side Frame. Remove Main Spring. Remove Rack Restoring Actuator Connecting Link (4) Plate (15). Unhook Spring (7) from Positive Rack Restoring Bell Crank (3). Remove three mounting screws from Right side Frame and remove Frame. Unhook Revolving Sector Arm Detent Spring and Spring of Negative Character Printing Arm Latch (30) Plate (19) from Stud in Center Frame. Remove Keeper from stud. Loosen set screw in Full Stroke Spindle

MODELS 94 & 98 INSTRUCTIONS
DIS-MANTLE AND RE-ASSEMBLE PROCEDURE

Removing Right Side Frame

Collar and remove Spindle and Collar. Unhook Credit Balance Hammer Spring (25) Plate (19) from screw in Center Frame. Remove Credit Balance Hammer Screw, Washer and Credit Balance Hammer (33). Remove Revolving Sector Arm Detent, Spacer and Credit Balance Hammer Latch. Remove Revolving Sector Bracket Screws and remove Revolving Sector Arm, and Subtract Slide. Remove Stop Section Restoring Link. Remove Extend Key Link.

Removing Hammer Trip Shaft Assembly

Remove Keeper from left end of Hammer Trip Shaft. Unhook Dial Rack Raising Arm Slide Restoring Arm Spring (16) Plate (3) and remove Arm (17) from Shaft. Loosen screw in Right Arm (4) Plate (13) on Hammer Trip Shaft. Remove Keeper from Hammer Trip Link. Remove Link from Left Arm of Shaft. Turn Shaft Arm down and remove Pin. Unhook Spring (6) Plate (13) from Total Slide Lock Arm (1). Pull Shaft to right and remove Total Slide Lock Arm (1).

Removing Left Side Frame

Loosen Allen Screw in Backspace Cam. Drive Pin toward rear from Backspace Cam. Disconnect Spring, Keeper and .005 washer from Stud in Character Selector Shaft. Loosen two Pins in Cams on left end of Main Shaft. These Pins drive out toward rear. Disconnect Spring on Ribbon Feed Pawl. Remove Keepers from left end of Ribbon Feed Shaft. Unhook Spring (9) Plate (6) from Type Carrier Retaining Pawl (8). Remove Negative Total Link (14) Plate (18). Unhook Negative Total Link Operating Arm Assembly Spring from stud in left Center Frame. Remove Keeper from rear of left Ribbon Feed Link. Remove Keeper, Link and roll from rear stud of Total Slide. Disconnect Outer Block Arm Connecting Link (3) from Stud of Latch "B". Remove Blank Stroke Lock Bell Crank Link (2) from same stud. Remove Two-Speed Link. Loosen set screw in Backspace Shaft Arm (Arm in dwell of Plunger Bail). Unhook Spring from Division Lever. Remove Screw and outer portion of Division Lever.

Remove three Side Frame Screws. Remove Left Side Frame. Loosen Rear Type Rack Guide Comb and remove Type Racks. Remove Total Lock Cam. Remove Accumulator Lock and Latch Restoring Arm. Remove Wipe Pawl Cam and Spacing Washers from left end of Mainshaft. Remove Accumulator Cam Bracket and Accumulator Cam. Remove Character Stop, .010 Washers and Character Selector Shaft. Remove Accumulator Operating Plate, Total Bell Crank and Total Link. Remove Latch Restoring Plate and Latch Restoring Shaft. Remove Division Bail with Spring and Inner extension of Division Lever. Remove Center Tie Shaft Screws, Accumulator Section uplimit rolls and Center Tie Shaft.

Remove Accumulator Section Hexagon Tie Shaft and Eccentric Rolls and Plates. Remove Accumulator Section Support Plates, Screws and Nuts. Remove Accumulator Section. Remove Intermediate Rack Guide Comb by removing two Screws, Lock Washers and Spacers. Remove Hammer Guide Comb. Remove Paper Feed Link and Support Plate. Remove Left Screw from Hammer Restoring Bail and remove Bail. Remove Right Ribbon Feed Link from Main Shaft. Remove Motor Drive Arm. (Be sure to loosen Allen Screw in Base). Loosen Allen Screw in Type Carrier Operating Cam (2) Plate (6). Remove Main Shaft. Remove Rack Restoring Shaft Assembly by driving Pin to the front and removing Keeper from Rack Restoring Bail. (Be careful to keep Rolls on Bail in the proper order.) Remove Carry Latch Springs, Carry Latches, and Carry Pawls. (Keep spacing in proper order.)

Removing Left Side Frame

Remove Credit Balance Bell Crank Pawl Lift Arm (7), Plate (19). Remove Pins from Front Accumulator Guide Bar Plate. Remove Center Mechanism Support (8), Plate (15) by removing four screws. Drive Pins from Rack Restoring Actuator Assembly (5), Plate (15). Remove Reset Gear, Reset Link Guide Bracket and Rack Restoring Acutator Roll Assembly.

Unhook Accumulator Rack Springs from Accumulator Racks. Remove Front Accumulator Guide Bar. Remove Intermediate Gears. Remove Accumulator Racks by pulling Racks to front, sliding rear Accumulator Guide Bar to right out of left Center Frame and lifting Racks up, holding Hammers forward. Have Instructor Inspect machine before Re-Assembly.

Replace Accumulator Racks. Replace Intermediate Gears. Replace Front Accumulator Guide Bar. Replace Rack Restoring Roll Assembly, Reset Link Guide Bracket and Reset Gears. Replace Center Mechanism Support (8), Plate (15). (Check Rack Restoring Actuator Assembly for free.)

Replace Hammer Guide Comb and Intermediate Rack Guide Comb. (Check Accumulator Racks for free.) Replace Rack Restoring Shaft, Bail and Rolls. (Check for free and proper end play.) Replace Credit Balance Bell Crank Pawl Lift Arm (7), Plate (19). Replace Center Tie Shaft. Replace Carry Pawls. (Check for free, alignment with Racks, and end play.) Replace Carry Pawl Latches. (Check for free, end play and alignment with Pawls.) Replace Carry Latch Springs. Remove Center Tie Shaft. Replace Accumulator Section, Support Plates, Screws and Nuts, Hexagon Tie Shaft, Eccentric Rolls and Plates.

Replace Center Tie Shaft. (Check alignment of wheels with Racks, end play and for free.) Replace Main Shaft and Type Carrier Operating Cam (2), Plate (6) on Shaft with Flat Surface toward front. Replace Hammer Restoring Bail with Screw in left end of Bail. Replace Paper Feed Link, Support Plate with Spacer and Screw and Roll in raceway of Main Shaft. Replace Right Ribbon Feed Link on Main Shaft. Replace Division Bail (18), Plate (1) with Spring and Inner Extension of Division Lever.

Replace Latch Restoring Shaft and Plate. Replace Accumulator Operating Plate, Total Bell Crank and Total Link. Replace Character Selector Shaft, .010 Washer and Character Stop. Replace Accumulator Cam and Bracket. Replace Spacing Washers and Spacer on left end of Main Shaft and Wipe Pawl Support Arm. (Check end play in Main Shaft.) Replace Accumulator Lock and Latch Restoring Arm. Replace Total Lock Cam. Replace Type Racks and tighten Rear Type Rack Guide Comb.

Replacing Left Side Frame

Replace Left Ribbon Feed Link to Ribbon Feed Pawl with Keeper. Replace Non-Add and Sub-Total Link over Stud of Character Selector Arm. Replace Keeper and Spring on Stud of Arm. Replace Blank Stroke Lock Bell Crank Link (2), Plate (18), on Stud of Latch "B". Replace Outer Block Arm Connecting Link (3) on same Stud. Replace Keeper Hook Type Carrier Retaining Pawl Spring (9), Plate (6), on Pawl. Replace three mounting Screws in Left Side Frame. Replace Backspace Cam and tighten Pin and Allen Set Screw. Tighten Pins in Cams on Left end of Main Shaft. Place Keeper on left end of Ribbon Reverse Shaft and hook Ribbon Feed Pawl Spring. Hook Negative Total Link Operating Arm Assembly Spring to Stud in Left Center Frame. Replace Roll, Link and Keeper on rear stud of Total Slide.

Replacing Hammer Trip Shaft

Start Hammer Trip Shaft in from right side thru Center Frames. Replace Left Hammer Trip Arm and Pin, replace Total Slide Lock Arm (1), Plate (13), on Shaft. Replace Hammer Trip Link on Stud of Left Hammer Trip Arm. Replace Dial Rack Raising Slide Restoring Arm (17), Plate (3), and Keeper on Shaft. Replace Spring (16) on Dial Rack Raising Slide Restoring Arm and hook to Stud on Left Side Frame. Hook Total Slide Lock Arm Spring (6), Plate (13), to Stud in Hammer Trip Link. Replace Two-Speed Link.

Replacing Right Side Frame

Replace Extend Key Link and Stop Section Restoring Link. Replace Subtract Slide with Revolving Sector Arm and replace mounting screws and lock washers in Revolving Sector Arm Bracket. Replace Full Stroke Spindle, Set Collar and tighten set screw. Replace Positive Restoring Actuating Link (4), Plate (15), to Restoring Bail.

Replace Credit Balance Hammer Latch, Spacer and Revolving Sector Arm Detent. Replace Keeper. Replace Credit Balance Hammer, Mounting Screw and Washer. Hook Credit Balance Hammer Spring to Screw in Center Frame. Hook Credit Balance Hammer Latch and Revolving Sector Detent Springs to Stud in Center Frame. Replace Right Side Frame and three Mounting Screws. Replace Keepers on right end of Ribbon Reverse and Hammer Trip Shaft. Hook-up Ribbon Feed Pawl Spring. Replace Subtract Block Cam. Pin drives toward front. Hook Spring (7), Plate (15), to Positive Rack Restoring Bell Crank. Hook Non-Print Bail Restoring Arm Assembly Spring to Stud on inside of Right Side Frame. Replace Main Spring.

Replace Subtract Slide Pawl Raising Bell Crank (20), Plate (18) on Stud in Reset Link Guide Bracket and on Stud of Frame with a .010 Spacer and Keeper. Hook Spring on Bell Crank. Replace Motor Control Arm Link (26), Plate (2), on Division Shaft Latch (11) with Keeper. Replace Backspace Release Arm (29), Plate 5. Drive Pin toward front. Replace Non-Print Bail Latch Link (12), Plate (14), on Latch (3) and Backspace Release Arm with Keeper. Replace Motor Drive Arm.

Replacing Division Shaft

Replace Non-Add Release Link on Stud in Left Side Frame. Replace Negative Total Link (14), Plate (18), and Keeper to Negative Total Link Operating Arm Assembly and hook Spring from Pawl to Link. Replace Subtract Yield Arm (24), Plate (2), Subtract Operating Arm (place character Index Link over Stud of Character Stop), Total Key Lock Stop Trip Arm (22). Replace Decimal Operating Bail (2), Plate (11), placing link on Stud of Motor Drive Control Bell Crank. Replace .010 Spacer over Stud. Replace Subtract Operating Bail (12), Plate (2). Replace Subtract Slide Shift Plate Lift Arm (15), Plate (18), placing right end on Stud in Subtract Yield Arm. Place front of Negative Total Link (14), Plate (18), on Stud in left end of Subtract Slide Shift Plate Lift Arm. Replace Keeper. Replace Outer portion of Division Lever and replace mounting screw. Hook Spring from Arm "A" to Division Lever. Replace Division Drive Arm (3), Plate (1). Replace Division Shaft thru linkage. Be sure spacer is between Total Key Lock Stop Trip Arm (22), Plate (2), and Subtract Yield Arm (24) and Spacer Between Subtract Operating Arm and Subtract Operating Bail (12), Plate (2).

Hook Spring on Decimal Operating Bail (2), Plate (11). Hook Total Key Lock Link Stop Trip Arm Spring to stud in Frame. Hook Subtract Shaft Yield Arm Spring to Stud. Hook Subtract Operating Bail Spring to Stud in Frame. Replace Right Division Shaft Arm (10), Plate (2), on Division Shaft with Links over stud of Motor Control Bell Crank. Place spacer between links.

## Replacing Stop Section

Replace Stop Section with Rear Rail. Check for one steel spacer on left and steel spacer and Leather Washers on right side. Replace Front Rail. Replace Right Rear Rail Screw. Replace Washer, Division Control Arm (2), Plate (1), and Mounting Screw in left end of Rear Rail. Hook Inner Spring from Division Control Arm (2) to Stud in Left Side Frame. Connect Stop Section Link with Restoring Arm. Hook Stop Section Spring.

## Replacing Feature Key Shaft

Slide Shaft thru from right side placing Decimal Print Bail (4), Plate (11), on Shaft. Replace Decimal Block Arm Operating Link (6). Replace Spacer and Left Arm on left end of Shaft and Drive Pin. Hook two latch springs (29), Plate (2), on right side to Stud in Right Side Frame.

## Replacing Keyboard Assembly

Replace Keyboard. (Be sure to replace Sub-Total Link Assembly (3), Plate (16) in slot of Sub-Total Bell Crank (2).) Replace Total Yoke and Shaft. Turn Retaining Plate and tighten screw. Replace Blank Stroke Lock Arm and Lock Plate Link Bell Crank (15), Plate (8), with flanged Bushing between these parts. Replace Automatic Subtract Key Control Catch (3), Plate (10) and Down Limit Screw (7) with Roll (6). Hook Spring (8) on front. Replace spacer on front and Keepers. Replace Reset Shaft Lever (43), Plate (5), Hammer Catch Shaft Latch (28) and Trunion Nut (42). Hook up Spring (41) to Stud in Side Frame. Replace Link on Small Arm (0) of Constant Lever (35) with Spacer and Keeper. Replace Upper and Lower Marcel Links.

Replace Motor Control Shaft (11), Plate (3), thru Right Side Frame. Replace Non-Add Bell Crank (10) on Shaft (11). Replace Left Arm (K) on Shaft. Drive Pin in Left Arm. This Pin Drives down. Replace Motor Bar Key Stem, Bushing and Decimal Key Stem and Mounting Screw. Hook Spring to stud in Frame. Replace Multiply Lever Guide Bracket (6), Plate (12). Hook Non-Add Drive Pawl Spring to Stud in Bracket. Hook Motor Drive Control Arm Drive Pawl Spring (15), Plate (3), to hole in Bracket and Short Cut Key Stem Block Arm Spring (9), Plate (7) to Stud in Bracket. Replace Release Key Lever Extension (2), Plate (9). Replace Release Arm Link (8), Plate (9). Top Link (8) is held by Spring. Replace Blank Stroke Lock Bell Crank (5), connect to Link. Replace Constant Lever Release Arm (9), Plate (8). Make 93100 Adjustments. Replace Two-Color Ribbon Mechanism. Run 93100 Test.

## Replacing Misc. Mult. & Division Parts

Replace Links No. "2" and "3", Plate (3). Replace spacer and Keeper on Stud in Division Bail (18), Plate (1). Hook up Springs. Replace Mult. Block Slide with Spacer and Keeper on Stud in Keyboard. Replace Backspace Control Pawl Operating Arm Assembly (13), Plate (4) and Spring in Cotter Key in Base. Replace Dial Rack Raising Arm Slide (4), Plate (3) with Bushing, Washer and Keeper at rear and Roll and Keeper at front. Replace Mult. Lever Slide (2), Plate (7), Spacer, Bushing, Screw, Lock Washer and Nut. Hook Spring (15) to Stud in Frame. Hook Spring on rear of Dial Rack Raising Arm Slide. Replace Short Cut Key Block Arm (4), Plate (7) with Washer. Hook Spring to Stud in Frame. Hook Auxiliary Negative Mult. Arm Latch Spring (44), Plate (5) to Stud in Base. Hook Division Drive Arm Spring (25), Plate (1), to Stud in Base.

Replacing Misc. Mult. & Division Parts

Replace Negative Mult. Operating Arm (18), Plate (5), on left end of Division Shaft with Keeper. Hook Spring (21) to Stud in Base.

Replace Correction and Backspace Slide Plate with Screws, Lock Washers and Nut. Replace Backspace and Correction Slide. Replace Backspace Drive Arm (19) Plate (5) and Pawl (40). Hook Drive Arm Spring (38) to Side Frame. Replace Air Check.

Replace Short Cut Key Assembly with two Bushings, Screw and Correction and Backspace Slide Limit (22), Plate (18). Hook Short Cut Key Springs to Mult. Guide Bracket and Keyboard. Replace Negative Mult. Arm Latch (10) and Release (8), Plate (5). Hook Spring to stud in Mult. Lever Guide Bracket. Hook Correction and Backspace Slide Springs. Replace Correction and Backspace Slide Buttons. Replace Mult. Lever Button. Replace Short Cut Key Mechanism and Interlock Slide (36), Plate (4). Replace Printing Hammer Catch Shaft Assembly (23), Plate (5). Make Division, Mult. and Short Cut Adjustments. Run 98100 Test.